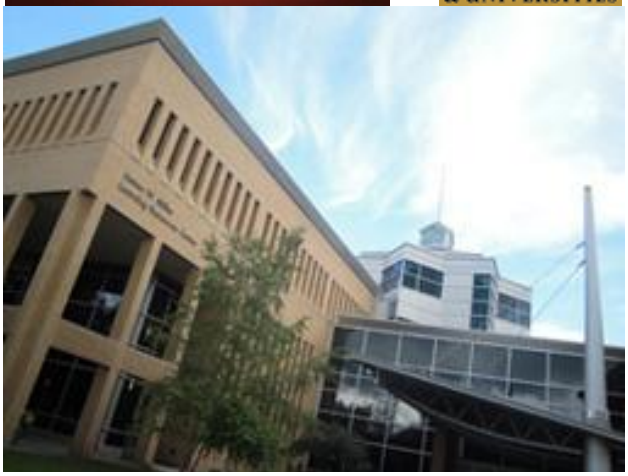
PBEEEP
State Government

Public Buildings Enhanced Energy Efficiency Program

Final Report
Investigation Results For
St Cloud State University, Part 2



Date: 9/5/2012

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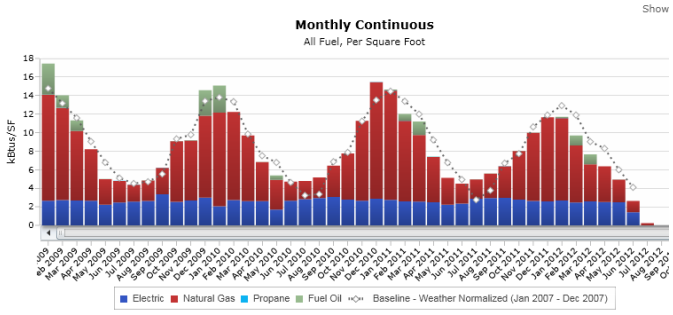
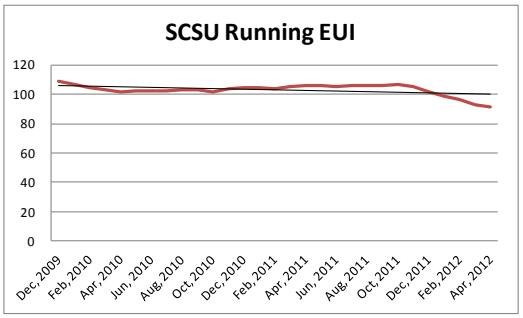
St Cloud State University, Part 2 Energy Investigation Overview

The goal of a PBEEEP Energy Investigation is to identify energy savings opportunities with a payback of fifteen years or less. Particular emphasis is on finding those opportunities that will generate savings with a relatively fast (1 to 5 years) and certain payback. During the investigation phase the provider conducts a rigorous analysis of the building operations. Through observation, targeted functional testing, and analysis of extensive trend and portable logger data, the RCx Provider identifies deficiencies in the operation of the mechanical equipment, lighting, envelope, and related controls. The investigation of St Cloud State University, Part 2 was performed by Sebesta Blomberg Engineering, Inc. This report is the result of that information.

Payback Information and Energy Savings				
Total project costs (Without Co-funding)			**Project costs with Co-funding**	
Total costs to date including study	$169,035		Total Project Cost	$206,875
Future costs including Implementation , Measurement & Verification	$37,840		Study and Administrative Cost Paid with ARRA Funds	($172,035)
Total Project Cost	$206,875		Utility Co-funding	($62,525)
			Total costs after co-funding	($27,685)
Estimated Annual Total Savings ($)	$8,642		Estimated Annual Total Savings ($)	$8,642
Total Project Payback	24		Total Project Payback with co-funding	NA
Electric Energy Savings*	**0.9%**	**and**	**Natural Gas Savings***	**1.4 %**

* prorated as 23% of entire campus





Year	Days	SF	Total kBtu	Normalized Baseline kBtu	Change from Baseline kBtu	% Change	Total Energy Cost $	Average Cost Rate $ /kBtu
2009	365	3,292,243	359,021,038	354,449,296	4,571,741	1%	$3,892,384.07	$0.01
2010	365	3,292,243	344,782,347	335,634,654	9,147,693	3%	$3,745,266.13	$0.01
2011	365	3,290,909*	333,801,426	342,823,967	-9,022,541	-3%	$3,756,243.99	$0.01

*Listed square footage represents an average for the given year

St Cloud State University, Part 2 Consumption Report
Total energy use decreased about 5% during the period of the investigation

STATE OF MINNESOTA B3 BENCHMARKING

Summary Tables

St Cloud State University, Site Information	
Location	740 4th Avenue South St. Cloud, MN 56301
Facility Manager	Tim Norton, Buildings and Grounds Director
Buildings	7
Interior Square Footage	3,136,612 total site 726,488 this project (23.1% of total building area)
PBEEEP Provider, Part 2 Investigation	Sebesta Blomberg, Inc.
Annual Energy Cost	$3,756,244 (from B3 2011)
Utility Company	Xcel Energy (natural gas and electricity) Tex-Par Oil and First Fuel Banks (fuel oil) Ferrellgas (propane)
Site Energy Use Index (EUI)	105 kBtu/sqft (at start of project) 102 kBtu/sqft (end of project)
Benchmark EUI (from B3)	124 kBtu/sqft

Building Name	State ID	Building Type	Area (ft^2)	Year Built
51 Building	E26073S1868	Academic	52,085	1968
51 Building Wing		Academic	6,150	1993
Education Bldg	E26073S1971	Academic	101,006	1971
Engineering/Computing Center	E26073S1258	Academic	91,840	1958
Kiehle Visual Arts Center	E26073S1152	Art Center	59,984	1952
Parking Ramp	E26073S5709	Parking Ramp	158,798	2008
Performing Arts Center	E26073S1768	Art Center	78,674	1968
Stewart Hall	E26073S0948	Academic	177,951	1948

Mechanical Equipment Summary Table (of buildings included in the investigation)	
1	Tracer Summit Building Automation System by Trane
8	Buildings
726,488	Interior Square Feet
34	Air Handlers
349	VAV Boxes
1	Exhaust Fans and Power Roof Ventilators
10	Unit Heaters
1	Chillers
20	Pumps (HW, CHW, Glycol, or CDW)
13	Heat Exchangers (Steam -HW, HW- Glycol, etc)
1,020	Approximate number of points available to be trended
480	Points required to be trended
93	Data loggers required (does not include lighting or occupancy sensors)

Implementation Information (Based on Investigated Building Area)			
Estimated Annual Total Savings ($)			$8,642
Total Estimated Implementation Cost ($)			$34,840
GHG Avoided in U.S Tons (CO2e)			91
Electric Energy Savings (kWh) 0.9 % Savings 28% of 2011 Electric Usage 7,078,109 kWh (from B3)			60,855
Electric Demand Savings (Peak kW) 0 % Savings 7,000 kW across three feed points in 2011(B3)			0
Natural Gas Savings (Therms) 1.4 % Savings 28% of 2011 Natural Gas Usage 513,530 Therms (from B3)			7,065
Statistics			
Number of Measures identified			13
Number of Measures with payback < 3 years			4
Screening Start Date	3/23/2010	Screening End Date	10/12/2010
Investigation Start Date	8/4/2011	Investigation End Date	7/31/2012
Final Report	9/5/2012		

St Cloud State University, Part 2 Cost Information			
Phase		**To date**	**Estimated**
Screening		$	
Investigation [Provider]		$124,750	
BAS Upgrades		$26,861	
Investigation [CEE]		$17,424	$1,000
Implementation			$34,840
Implementation [CEE]			$1,000
Measurement & Verification		0	$1,000
Total		$169,035	$37,840

Co-funding Summary	
Study and Administrative Cost	$172,035
Utility Co-Funding - Estimated Total ($)	$62,525
Total Co-funding ($)	$234,560

Facility Overview

The energy investigation identified 1.2% of prorated total energy savings at the buildings included in the St. Cloud State University, Part 2 Investigation (based on the fact that these were 23% of the total floor area at St. Cloud State University) with measures that payback in less than 15 years and do not adversely affect occupant comfort. The energy savings opportunities identified at St. Cloud State University are based on adjusting the schedule of equipment to match actual building occupancy hours, improving the operation of some VFDs, implementing a duct static pressure reset and repairing a stuck reheat valve. The total cost of implementing all the measures is $34,840.

Implementing all these measures can save the facility approximately $8,642 a year with a combined payback period of 4.0 years before rebates based on the implementation cost only (excluding study and administrative costs). The study rebates will be greater than the cost of implementing all the listed measures, leaving a surplus of $27,685 which can be applied to the implementation of measures in the Part 1 investigation. Implementing all of the identified measures will produce 0.9% electrical savings and 1.4 % natural gas savings. These buildings are currently performing at 17% below the Minnesota Benchmarking and Beyond database (B3) benchmark value; the median site EUI for State of Minnesota buildings are 23% lower than their corresponding B3 Benchmarks.

The primary energy intensive systems at St Cloud State University, Part 2 are described here:

Mechanical Equipment
The Heating and Cooling Plants were investigated in Part 1. Steam from the Heating Plant is routed to the buildings in underground tunnels and runs through steam to hot water heat exchangers located in each building. All of the Part 2 buildings use steam from the heating plant except for the Parking Ramp. The Central Chilled Water Plant circulates water throughout the campus to the buildings. Some of the buildings located further from the chilled water plant have their own chilled water pumps that distribute chilled water throughout those buildings.

Controls and Trending
All buildings in the Part 2 Investigation are controlled, to some extent, by a Tracer Summit Building Automation System (BAS) by Trane. Two of the buildings (the Performing Arts Center and Stewart Hall) have Building Control Unit (BCU) panels that are outdated and have limited memory. The BCU panels will be upgraded before the Part 2 investigation begins. Therefore, the automation system will be capable of trending all buildings in Part 2 before investigation begins.

Lighting
A lighting retrofit was conducted in 1996 throughout the campus, so the majority of indoor lighting is T8 32 watt lamps. Much of the indoor lighting is controlled by occupancy sensors and the outdoor lighting is controlled by the BAS, which operates the lighting based on schedules and photocells.

Metering
There are three main electric service entries for the campus which all serve a single campus loop; the service entries allow Xcel energy to balance loads served by three substations. The Public Safety Center and Parking Ramp share a natural gas and electric meter; otherwise none of the buildings are individually metered.

Findings Summary

Site: St Cloud State Part 2

Eco #	Building	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
4	51 Bldg	DAT Reset schedule	$2,070	$2,423	0.85	$0	0.85	21
11	Performing Arts Center	AHU F14 Scheduling	$1,380	$927	1.49	$0	1.49	11
1	Engineering/Computing Center	Air Handling Unit AHU-1 Schedule is excessive	$1,380	$871	1.58	$0	1.58	8
6	Engineering/Computing Center	Air Handling Unit AHU-2 Schedule is excessive	$1,380	$472	2.92	$0	2.92	6
8	Engineering/Computing Center	Air Handling Unit AHU-5 Schedule is excessive	$1,380	$446	3.09	$0	3.09	6
1	Education Bldg	AHU S-1, S-2, S-3 Scheduling is excessive	$4,260	$892	4.78	$0	4.78	11
5	51 Bldg	Duct Static Pressure Reset schedule	$2,070	$357	5.80	$0	5.80	4
1	Performing Arts Center	AHU F1 scheduling is excessive	$1,380	$186	7.43	$0	7.43	2
1	Stewart Hall	VFDs do not modulate	$9,540	$1,097	8.70	$0	8.70	11
4	Engineering/Computing Center	AHU S-2 Supply Fan VFD	$5,290	$543	9.74	$0	9.74	7
2	51 Bldg	VAV-002 reheat Valve Stuck	$1,950	$195	10.00	$0	10.00	2
3	Performing Arts Center	AHU F7 scheduling is excessive	$1,380	$130	10.58	$0	10.58	2
7	Engineering/Computing Center	Air Handling Unit AHU-4 Schedule is excessive	$1,380	$103	13.41	$0	13.41	1
		Total for Findings with Payback 3 years or less:	**$6,210**	**$4,693**	**1.32**	**$0**	**1.32**	**46**
		Total for all Findings:	**$34,840**	**$8,642**	**4.03**	**$0**	**4.03**	**91**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

St Cloud State
Checklist Summary

Finding Type Number	Finding Type	Relevant Findings	Looked for, not found	Not relevant
a.1 (1)	Time of Day enabling is excessive	2	4	
a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	5	1	
a.3 (3)	Lighting is on more hours than necessary.		6	
a.4 (4)	OTHER_Equipment Scheduling/Enabling		6	
b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed	1	5	
b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air		6	
b.3 (7)	OTHER_Economizer/OA Loads	1	5	
c.1 (8)	Simultaneous Heating and Cooling is present and excessive	2	4	
c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	2	4	
c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	1	5	
c.4 (11)	OTHER_Controls	1	5	
d.1 (12)	Daylighting controls or occupancy sensors need optimization		6	
d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal		6	
d.3 (14)	Fan Speed Doesn't Vary Sufficiently	4	2	
d.4 (15)	Pump Speed Doesn't Vary Sufficiently		6	
d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	2	4	
d.6 (17)	Other_Controls (Setpoint Changes)		6	
e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal		6	
e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal		6	
e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	1	5	
e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	1	5	
e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal		4	2
e.6 (22)	Other_Controls (Reset Schedules)		6	
f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit		5	1
f.2 (24)	Pump Discharge Throttled		5	1
f.3 (25)	Over-Pumping		5	1

f.4 (26)	Equipment is oversized for load.		5	1
f.5 (27)	OTHER_Equipment Efficiency/Load Reduction		6	
g.1 (28)	VFD Retrofit - Fans	1	3	2
g.2 (29)	VFD Retrofit - Pumps	1	4	1
g.3 (30)	VFD Retrofit - Motors (process)		3	3
g.4 (31)	OTHER_VFD		5	1
h.1 (32)	Retrofit - Motors		6	
h.2 (33)	Retrofit - Chillers		4	2
h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)		5	1
h.4 (35)	Retrofit - Boilers		5	1
h.5 (36)	Retrofit - Packaged Gas fired heating		5	1
h.6 (37)	Retrofit - Heat Pumps		5	1
h.7 (38)	Retrofit - Equipment (custom)		5	1
h.8 (39)	Retrofit - Pumping distribution method		5	1
h.9 (40)	Retrofit - Energy/Heat Recovery		5	1
h.10 (41)	Retrofit - System (custom)		5	1
h.11 (42)	Retrofit - Efficient Lighting		6	
h.12 (43)	Retrofit - Building Envelope		6	
h.13 (44)	Retrofit - Alternative Energy		6	
h.14 (45)	OTHER_Retrofit		6	
i.1 (46)	Differed Maintenance from Recommended/Standard		6	
i.2 (47)	Impurity/Contamination		6	
i.3 ( )	Leaky/Stuck Damper		6	
i.4 ( )	Leaky/Stuck Valve	2	4	
i.5 (48)	OTHER_Maintenance		6	
j.1 (49)	OTHER		6	

Findings Glossary: Findings Examples

a.1 (1)	**Time of Day enabling is excessive**
	• HVAC running when building is unoccupied. Equipment schedule doesn't follow building occupancy • Optimum start-stop is not implemented • Controls in hand
a.2 (2)	**Equipment is enabled regardless of need, or such enabling is excessive**
	• Fan runs at 2" static pressure. Lowering pressure to 1.8" does not create comfort problem and the flow is per design. • Supply air temperature and pressure reset: cooling and heating
a.3 (3)	**Lighting is on more hours than necessary**
	• Lighting is on at night when the building is unoccupied • Photocells could be used to control exterior lighting • Lighting controls not calibrated/adjusted properly
a.4 (4)	**OTHER Equipment Scheduling and Enabling**
	• Please contact PBEEEP Project Engineer for approval
b.1 (5)	**Economizer Operation – Inadequate Free Cooling**
	• Economizer is locked out whenever mechanical cooling is enabled (non-integrated economizer) • Economizer linkage is broken • Economizer setpoints could be optimized • Plywood used as the outdoor air control • Damper failed in minimum or closed position
b.2 (6)	**Over-Ventilation**
	• Demand-based ventilation control has been disabled • Outside air damper failed in an open position • Minimum outside air fraction not set to design specifications or occupancy
b.3 (7)	**OTHER Economizer/Outside Air Loads**
	• Please contact PBEEEP Project Engineer for approval
c.1 (8)	**Simultaneous Heating and Cooling is present and excessive**
	• For a given zone, CHW and HW systems are unnecessarily on and running simultaneously • Different setpoints are used for two systems serving a common zone
c.2 (9)	**Sensor / Thermostat needs calibration, relocation / shielding, and/or replacement**
	• OAT temperature is reading 5 degrees high, resulting in loss of useful economizer operation • Zone sensors need to be relocated after tenant improvements • OAT sensor reads high in sunlight
c.3 (10)	**Controls "hunt" / need Loop Tuning or separation of heating/cooling setpoints**
	• CHW valve cycles open and closed • System needs loop tuning – it is cycling between heating and cooling
c.4 (11)	**OTHER Controls**
	• Please contact PBEEEP Project Engineer for approval
d.1 (12)	**Daylighting controls or occupancy sensors need optimization**
	• Existing controls are not functioning or overridden • Light sensors improperly placed or out of calibration
d.2 (13)	**Zone setpoint setup / setback are not implemented or are sub-optimal**
	• The cooling setpoint is 74 ºF 24 hours per day
d.3 (14)	**Fan Speed Doesn't Vary Sufficiently**
	• Fan runs at 2" static pressure. Lowering pressure to 1.8" does not create comfort problem and the flow is per design. • Supply air temperature and pressure reset: cooling and heating

d.4 (15)	**Pump Speed Doesn't Vary Sufficiently**
	• Pump runs at 15 PSI on peak day. Lowering pressure to 12 does not create comfort problem and the flow is per design. Low ΔT across the chiller during low load conditions.
d.5 (16)	**VAV Box Minimum Flow Setpoint is higher than necessary**
	• Boxes universally set at 40%, regardless of occupancy. Most boxes can have setpoints lowered and still meet minimum airflow requirements.
d.6 (17)	**Other Controls (Setpoint Changes)**
	• Please contact PBEEEP Project Engineer for approval
e.1 (18)	**HW Supply Temperature Reset is not implemented or is sub-optimal**
	• HW supply temperature is a constant 180 ºF. It should be reset based on demand, or decreased by a reset schedule as OAT increases. • DHW Setpoints are constant 24 hours per day
e.2 (19)	**CHW Supply Temperature Reset is not implemented or is sub-optimal**
	• CHW supply temperature is a constant 42 ºF. It could be reset, based on demand or ambient temperature.
e.3 (20)	**Supply Air Temperature Reset is not implemented or is sub-optimal**
	• The SAT is constant at 55 ºF. It could be reset to minimize reheat and maximize economizer cooling. The reset should ideally be based on demand (e.g., looking at zone box damper positions), but could also be reset based on OAT.
e.4 ( )	**Supply Duct Static Pressure Reset is not implemented or is suboptimal**
	• The Duct Static Pressure (DSP) is constant at 1.5" wc. It could be reset to minimize fan energy. The reset should ideally be based on demand (e.g. looking at zone box damper positions), but could also be reset based on OAT.
e.5 (21)	**Condenser Water Temperature Reset is not implemented or is sub-optimal**
	• CW temperature is constant leaving the tower at 85 ºF. The temperature should be reduced to minimize the total energy use of the chiller and tower. It may be worthwhile to reset based on load and ambient conditions.
e.6 (22)	**Other Controls (Reset Schedules)**
	• Please contact PBEEEP Project Engineer for approval
f.1 (23)	**Lighting system needs optimization - Spaces are overlit**
	• Lighting exceeds ASHRAE or IES standard levels for specific space types or tasks
f.2 (24)	**Pump Discharge Throttled**
	• The discharge valve for the CHW pump is 30% open. The valve should be opened and the impeller size reduced to provide the proper flow without throttling.
f.3 (25)	**Over-Pumping**
	• Only one CHW pump runs when one chiller is running. However, due to the reduced pressure drop in the common piping, the pump is providing much greater flow than needed.
f.4 (26)	**Equipment is oversized for load**
	• The equipment cycles unnecessarily • The peak load is much less than the installed equipment capacity

f.5 (27)	**OTHER Equipment Efficiency/Load Reduction**
	• Please contact PBEEEP Project Engineer for approval
g.1 (28)	**VFD Retrofit Fans**
	• Fan serves variable flow system, but does not have a VFD. • VFD is in override mode, and was found to be not modulating.
g.2 (29)	**VFD Retrofit - Pumps**
	• 3-way valves are used to maintain constant flow during low load periods. • Only one CHW pumps runs when one chiller is running. However, due to the reduced pressure drop in the common piping, the pump is providing much greater flow than needed.
g.3 (30)	**VFD Retrofit - Motors (process)**
	• Motor is constant speed and uses a variable pitch sheave to obtain speed control.
g.4 (31)	**OTHER VFD**
	• Please contact PBEEEP Project Engineer for approval
h.1 (32)	**Retrofit - Motors**
	• Efficiency of installed motor is much lower than efficiency of currently available motors
h.2 (33)	**Retrofit - Chillers**
	• Efficiency of installed chiller is much lower than efficiency of currently available chillers
h.3 (34)	**Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)**
	• Efficiency of installed air conditioner is much lower than efficiency of currently available air conditioners
h.4 (35)	**Retrofit - Boilers**
	• Efficiency of installed boiler is much lower than efficiency of currently available boilers
h.5 (36)	**Retrofit - Packaged Gas-fired heating**
	• Efficiency of installed heaters is much lower than efficiency of currently available heaters
h.6 (37)	**Retrofit - Heat Pumps**
	• Efficiency of installed heat pump is much lower than efficiency of currently available heat pumps
h.7 (38)	**Retrofit - Equipment (custom)**
	• Efficiency of installed equipment is much lower than efficiency of currently available equipment
h.8 (39)	**Retrofit - Pumping distribution method**
	• Current pumping distribution system is inefficient, and could be optimized. • Pump distribution loop can be converted from primary to primary-secondary)
h.9 (40)	**Retrofit - Energy / Heat Recovery**
	• Energy is not recouped from the exhaust air. • Identification of equipment with higher effectiveness than the current equipment.
h.10 (41)	**Retrofit - System (custom)**
	• Efficiency of installed system is much lower than efficiency of another type of system
h.11 (42)	**Retrofit - Efficient lighting**
	• Efficiency of installed lamps, ballasts or fixtures are much lower than efficiency of currently available lamps, ballasts or fixtures.

h.12 (43)	**Retrofit - Building Envelope**
	• Insulation is missing or insufficient • Window glazing is inadequate • Too much air leakage into / out of the building • Mechanical systems operate during unoccupied periods in extreme weather
h.13 (44)	**Retrofit - Alternative Energy**
	• Alternative energy strategies, such as passive/active solar, wind, ground sheltered construction or other alternative, can be incorporated into the building design
h.14 (45)	**OTHER Retrofit**
	• Please contact PBEEEP Project Engineer for approval
i.1 (46)	**Differed Maintenance from Recommended/Standard**
	• Differed maintenance that results in sub-optimal energy performance. • Examples: Scale buildup on heat exchanger, broken linkages to control actuator missing equipment components, etc.
i.2 (47)	**Impurity/Contamination**
	• Impurities or contamination of operating fluids that result in sub-optimal performance. Examples include lack of chemical treatment to hot/cold water systems that result in elevated levels of TDS which affect energy efficiency.
i.3 ( )	**Leaky/Stuck Damper**
	• The outside or return air damper on an AHU is leaking or is not modulating causing the energy use go up because of additional load to the central heating and/or cooling plant.
i.4 ( )	**Leaky/Stuck Valve**
	• The heating or cooling coil valve on an AHU is leaking or is not modulating causing the energy use go up because of additional load to the central heating and/or cooling plant.
i.5 (48)	**OTHER Maintenance**
	• Please contact PBEEEP Project Engineer for approval
j.1 (49)	**OTHER**
	• Please contact PBEEEP Project Engineer for approval

Findings Summary

Building: 51 Bldg
Site: St Cloud State Part 2

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
4	DAT Reset schedule	$2,070	$2,423	0.85	$0	0.85	21
5	Duct Static Pressure Reset schedule	$2,070	$357	5.80	$0	5.80	4
2	VAV-002 reheat Valve Stuck	$1,950	$195	10.00	$0	10.00	2
	Total for Findings with Payback 3 years or less:	**$2,070**	**$2,423**	**0.85**	**$0**	**0.85**	**21**
	Total for all Findings:	**$6,090**	**$2,975**	**2.05**	**$0**	**2.05**	**27**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: 51 Bldg

FWB Number:	11651	Eco Number:	2
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	VAV-002 reheat Valve Stuck	Date Identified:	6/12/2012
Description of Finding:	VAV-002 reheat valve is not operating correctly. Space temperature is 78 degrees and a supply temperature of 83+ degrees.		
Equipment or System(s):	VAV terminal unit	Finding Category:	Maintenance Related Problems
Finding Type:	Leaky/Stuck Valve		

Implementer:	Mechanical Contractor	Benefits:	Energy Savings, Comfort, Maintenance
Baseline Documentation Method:	Trending of VAV-002 DAT, Space Temp, Air flow. Trends indicate overly warm space temps due to SAT above 80 degrees		
Measure:	Fix/Replace Failed Reheat Valve		
Recommendation for Implementation:	Specifically diagnose the VAV box valve failure as to calibration, mapping, control, hardware or physical functional value of the valve components. Replace what is necessary for proper function. The costs included assume replacement of the entire valve.		
Evidence of Implementation Method:	Trend the reheat valve position, AHU DAT, VAV DAT, space temperature, and OAT at 15 minute intervals for 2 weeks when the OAT is below 50F. Verify that the valve position command will correspond to air temperature rise across the reheat coil. When the reheat valve position is 0% open, there will be no (at least every little) heat gain.		

Annual Natural Gas Savings (therms):	309	Contractor Cost ($):	$1,150
Estimated Annual Natural Gas Savings ($):	$195	PBEEEP Provider Cost for Implementation Assistance ($):	$800
		Total Estimated Implementation Cost ($):	$1,950

Estimated Annual Total Savings ($):	$195	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	10.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	10.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	2	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	2.3%	Percent of Implementation Costs:	5.6%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: 51 Bldg

FWB Number:	11651	Eco Number:	4
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	DAT Reset schedule	Date Identified:	6/25/2012
Description of Finding:	The DAT is currently set to 62 degrees all year. The DAT should increase based on the OAT during the heating season.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Controls (Reset Schedules)
Finding Type:	Supply Air Temperature Reset is not implemented or is sub-optimal		

Implementer:	Controls contractor	Benefits:	Energy Savings
Baseline Documentation Method:	Trending of AHU-1 with DAT and OAT. Trends indicate a constant 62 degrees.		
Measure:	Discharge Air Temperature Reset		
Recommendation for Implementation:	Modify the existing controls sequence such that the discharge air temperature of the air handing unit is actively reset to the warmest possible temperature while maintaining cooling requirements in the worst case zone. Polling of terminal devices is required to determine the worst case zone and being able to satisfy loads. Modify the controls sequences so that the MAT is maintained at the DAT setpoint whenever possible, except for when the OAT is above the economizer lockout (71F recommended) or the OA damper is at minimum position in order to ensure adequate ventilation.		
Evidence of Implementation Method:	Trend logs. Trend the AHU SF status and speed, DAT, DAT setpoint, RAT, MAT, heating valve, cooling valve, duct static pressure, OA damper, OAT, zone temps, zone temp setpoints, VAV box reheat valves, and VAV box damper positions at 15 minute intervals for 2 weeks during the summer, winter and shoulder seasons. Verify that the DAT setpoint of the air handing units increases according to limitations in demand from the terminals and that the zone temp setpoints are maintained..		

Annual Natural Gas Savings (therms):	3,834	Contractor Cost ($):	$1,270
Estimated Annual Natural Gas Savings ($):	$2,423	PBEEEP Provider Cost for Implementation Assistance ($):	$800
		Total Estimated Implementation Cost ($):	$2,070

Estimated Annual Total Savings ($):	$2,423	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.85	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.85	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	21	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	28.0%	Percent of Implementation Costs:	5.9%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

PBEEEP State Government

Building: 51 Bldg

FWB Number:	11651	Eco Number:	5
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	Duct Static Pressure Reset schedule	Date Identified:	6/25/2012
Description of Finding:	The duct static pressure setpoint is a constant 1" all year.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Controls (Reset Schedules)
Finding Type:	Supply Duct Static Pressure Reset is not implemented or is sub-optimal		

Implementer:	Controls contractor	Benefits:	Energy Savings
Baseline Documentation Method:	Trending of AHU-1 Duct Static pressure, duct static pressure setpoint. Trends indicate a constant setpoint of 1" wc.		
Measure:	Duct Static Pressure Reset		
Recommendation for Implementation:	Modify the existing controls sequence so that the static pressure setpoint shall be reset using trim and response logic within the range 0.15 inches to 1 inches. When the fan is off, freeze setpoint at the minimum value (0.15 inches). While the fan is proven on, every 2 minutes, decrease the setpoint by 0.04 inches if there are two (adjustable) or fewer pressure requests. If there are more than two (adjustable) pressure requests, increase the setpoint by 0.04 inches. Where VAV zone damper position is known, a pressure request is generated when any VAV damper served by the system is wide open. Where VAV zone damper position is unknown, a pressure request is made when the ratio of the zone's actual supply airflow to supply airflow setpoint is less than 90%.		
Evidence of Implementation Method:	Trend logs. Trend the AHU SF status and speed, DAT, RAT, MAT, heating valve, cooling valve, duct static pressure, duct static pressure setpoint, OA damper, OAT, zone temps, zone temp setpoints, VAV box reheat valves, and VAV box damper positions at 15 minute intervals for 2 weeks during the summer, winter and shoulder seasons. Verify that the duct static pressure setpoint changes depending on the loading of the building in lieu of being set to a single static value.		

Annual Electric Savings (kWh):	3,030	Annual Natural Gas Savings (therms):	235
Estimated Annual kWh Savings ($):	$208	Estimated Annual Natural Gas Savings ($):	$149
Contractor Cost ($):	$1,270		
PBEEEP Provider Cost for Implementation Assistance ($):	$800		
Total Estimated Implementation Cost ($):	$2,070		

Estimated Annual Total Savings ($):	$357	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	5.80	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	5.80	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	4	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	4.1%	Percent of Implementation Costs:	5.9%

Findings Summary

Building: Education Bldg
Site: St Cloud State Part 2

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	AHU S-1, S-2, S-3 Scheduling is excessive	$4,260	$892	4.78	$0	4.78	11
	Total for Findings with Payback 3 years or less:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**
	Total for all Findings:	**$4,260**	**$892**	**4.78**	**$0**	**4.78**	**11**

Findings Details

Building: Education Bldg

FWB Number:	11652	Eco Number:	1
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	AHU S-1, S-2, S-3 Scheduling is excessive	Date Identified:	9/28/2011
Description of Finding:	AHU-S1, S-2,S-3 are scheduled to run from 6:00-21:30 on weekdays. Schedule could be reduced to 7:00-21:30 (1 hour).		
Equipment or System(s):	AHU with cooling only	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff	Benefits:	Electric savings, Chilled water savings.
Baseline Documentation Method:	Trending data from the AHU-S1, AHU-S2, AHU-S3 fan statuses indicate that the fans run from 6:00 to 21:30 on weekdays.		
Measure:	Change occupancy schedule to Occupied from 7:00 to 2130		
Recommendation for Implementation:	AHU-1 shall be scheduled ON from 7:00-21:30 on weekdays.		
Evidence of Implementation Method:	AHU-1, AHU-2, AHU-3 Supply fan status point trended every 15 minutes for 3 consecutive months.		

Annual Electric Savings (kWh):	12,995	Contractor Cost ($):	$534
Estimated Annual kWh Savings ($):	$892	PBEEEP Provider Cost for Implementation Assistance ($):	$3,726
		Total Estimated Implementation Cost ($):	$4,260

Estimated Annual Total Savings ($):	$892	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	4.78	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	4.78	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	11	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	10.3%	Percent of Implementation Costs:	12.2%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Summary

Building: Engineering/Computing Center

Site: St Cloud State Part 2

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Air Handling Unit AHU-1 Schedule is excessive	$1,380	$871	1.58	$0	1.58	8
6	Air Handling Unit AHU-2 Schedule is excessive	$1,380	$472	2.92	$0	2.92	6
8	Air Handling Unit AHU-5 Schedule is excessive	$1,380	$446	3.09	$0	3.09	6
4	AHU S-2 Supply Fan VFD	$5,290	$543	9.74	$0	9.74	7
7	Air Handling Unit AHU-4 Schedule is excessive	$1,380	$103	13.41	$0	13.41	1
	Total for Findings with Payback 3 years or less:	**$2,760**	**$1,343**	**2.05**	**$0**	**2.05**	**14**
	Total for all Findings:	**$10,810**	**$2,435**	**4.44**	**$0**	**4.44**	**27**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Engineering/Computing Center

FWB Number:	11653	Eco Number:	1
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	Air Handling Unit AHU-1 Schedule is excessive	Date Identified:	8/17/2011
Description of Finding:	AHU-1 is scheduled to run from 6:00-22:00 on Monday thru Thursday; could be reduced to 7:00-19:00. AHU is scheduled to run from 6:00-17:00 on Friday; could be reduced to 7:00-17:00. AHU is scheduled to run from 7:00-17:00 on Saturday; could be reduced to 8:00-17:00. Unit was also on during labor day, could be turned off during holidays.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff
Benefits:	Electric savings
Baseline Documentation Method:	Trending data from the AHU's fan status indicate the previously stated operation schedule.
Measure:	Change AHU to run in occupied mode from 7:00-19:00 on Monday thru Thursday, 7:00-17:00 on Friday, 8:00-17:00 on Saturdays, and off during holidays.
Recommendation for Implementation:	AHU-1 shall be scheduled ON from 7:00-19:00 Monday thru Thursday, 7:00-17:00 Friday, and 8:00-17:00 on Saturday. AHU-1 shall be scheduled OFF on Sunday and on Holidays.
Evidence of Implementation Method:	Trend the AHU-1 Supply fan status point every 15 minutes for 3 consecutive months. Analyze data to ensure that the AHU is on according to the proposed schedule.

Annual Electric Savings (kWh):	79	Annual Natural Gas Savings (therms):	1,370
Estimated Annual kWh Savings ($):	$5	Estimated Annual Natural Gas Savings ($):	$866
Contractor Cost ($):	$138		
PBEEEP Provider Cost for Implementation Assistance ($):	$1,242		
Total Estimated Implementation Cost ($):	$1,380		

Estimated Annual Total Savings ($):	$871	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	1.58	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	1.58	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	8	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	10.1%	Percent of Implementation Costs:	4.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Engineering/Computing Center

FWB Number:	11653	Eco Number:	4
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	AHU S-2 Supply Fan VFD	Date Identified:	8/18/2011
Description of Finding:	The supply fan VFD is currently acting as a constant volume fan. It is at 10% when the fan is commanded OFF and 100% when the fan is commanded ON. Implementing variable flow would save energy.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Controls (Setpoint Changes)
Finding Type:	Fan Speed Doesn't Vary Sufficiently		

Implementer:	Controls Contractor	Benefits:	Electric savings
Baseline Documentation Method:	Trending data indicates supply fan VFD runs at constant speeds.		
Measure:	Supply Fan VFD speed		
Recommendation for Implementation:	AHU-2 Supply fan shall modulate with VFD control according to maintain the space temperature setpoint.		
Evidence of Implementation Method:	Trend the AHU-2 Supply fan status and speed, duct static pressure, duct static pressure setpoint, all VAV flows, and OAT every 15 minutes for 3 consecutive months. Analyze data to ensure that the AHU meets the duct static pressure setpoint and that the VAV boxes meet the flow setpoints.		

Annual Electric Savings (kWh):	7,909	Contractor Cost ($):	$2,806
Estimated Annual kWh Savings ($):	$543	PBEEEP Provider Cost for Implementation Assistance ($):	$2,484
		Total Estimated Implementation Cost ($):	$5,290

Estimated Annual Total Savings ($):	$543	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	9.74	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	9.74	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	7	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	6.3%	Percent of Implementation Costs:	15.2%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Engineering/Computing Center

FWB Number:	11653	Eco Number:	6
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	Air Handling Unit AHU-2 Schedule is excessive	Date Identified:	12/9/2011
Description of Finding:	AHU-2 is scheduled to run from 6:00-23:00 on Monday thru Thursday; could be reduced to 7:00-19:00. AHU is scheduled to run from 6:00-17:00 on Friday; could be reduced to 7:00-17:00. AHU is scheduled to run from 13:00-23:00 on Sunday; could be reduced to 13:00-19:00. Unit was also on during labor day, could be turned off during holidays.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff	Benefits:	Electric savings
Baseline Documentation Method:	Trending data from the AHU's fan status indicate the previously stated operation schedule.		
Measure:	Change AHU to run in occupied mode from 7:00-19:00 on Monday thru Thursday, 7:00-17:00 on Friday, 12:00-17:00 on Saturdays, and off during holidays.		
Recommendation for Implementation:	AHU-2 shall be scheduled ON from 7:00-19:00 Monday thru Thursday, 7:00-17:00 Friday, 8:00-17:00 on Saturday, and 13:00-19:00 on Sunday. AHU-2 shall be scheduled OFF on Holidays.		
Evidence of Implementation Method:	Trend the AHU-2 Supply fan status point every 15 minutes for 3 consecutive months. Analyze data to ensure that the AHU is on according to the proposed schedule.		

Annual Electric Savings (kWh):	6,877	Contractor Cost ($):	$138
Estimated Annual kWh Savings ($):	$472	PBEEEP Provider Cost for Implementation Assistance ($):	$1,242
		Total Estimated Implementation Cost ($):	$1,380

Estimated Annual Total Savings ($):	$472	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	2.92	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	2.92	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	6	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	5.5%	Percent of Implementation Costs:	4.0%

Findings Details

Building: Engineering/Computing Center

FWB Number:	11653	Eco Number:	7
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	Air Handling Unit AHU-4 Schedule is excessive	Date Identified:	12/9/2011
Description of Finding:	AHU-4 is scheduled to run from 6:30-21:00 on Monday thru Thursday; could be reduced to 7:00-19:00. AHU is scheduled to run from 6:30-21:00 on Friday; could be reduced to 7:00-17:00.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff	Benefits:	Electric savings
Baseline Documentation Method:	Trending data from the AHU's fan status indicate the previously stated operation schedule.		
Measure:	Change AHU to run in occupied mode from 7:00-19:00 on Monday thru Thursday, 7:00-17:00 on Friday.		
Recommendation for Implementation:	AHU-4 shall be scheduled ON from 7:00-19:00 Monday thru Thursday and 7:00-17:00 on Friday. AHU-4 shall be scheduled OFF on Holidays.		
Evidence of Implementation Method:	Trend the AHU-4 Supply fan status point every 15 minutes for 3 consecutive months. Analyze data to ensure that the AHU is on according to the proposed schedule.		

Annual Electric Savings (kWh):	1,499	Contractor Cost ($):	$138
Estimated Annual kWh Savings ($):	$103	PBEEEP Provider Cost for Implementation Assistance ($):	$1,242
		Total Estimated Implementation Cost ($):	$1,380

Estimated Annual Total Savings ($):	$103	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	13.41	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	13.41	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	1	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	1.2%	Percent of Implementation Costs:	4.0%

Findings Details

Building: Engineering/Computing Center

FWB Number:	11653	Eco Number:	8
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	Air Handling Unit AHU-5 Schedule is excessive	Date Identified:	12/9/2011
Description of Finding:	AHU-5 is scheduled to run from 9:30-0:30 every day; could be reduced to 9:30-19:00.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff
Benefits:	Electric savings
Baseline Documentation Method:	Trending data from the AHU's fan status indicate the previously stated operation schedule.
Measure:	Change AHU to run in occupied mode from 9:30-19:00 on Monday thru Sunday.
Recommendation for Implementation:	AHU-5 shall be scheduled ON from 9:30-19:00 Monday thru Sunday. AHU-5 shall be scheduled OFF on Holidays.
Evidence of Implementation Method:	Trend the AHU-5 Supply fan status point every 15 minutes for 3 consecutive months. Analyze data to ensure that the AHU is on according to the proposed schedule.

Annual Electric Savings (kWh):	6,498	Contractor Cost ($):	$138
Estimated Annual kWh Savings ($):	$446	PBEEEP Provider Cost for Implementation Assistance ($):	$1,242
		Total Estimated Implementation Cost ($):	$1,380

Estimated Annual Total Savings ($):	$446	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	3.09	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	3.09	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	6	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	5.2%	Percent of Implementation Costs:	4.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Summary

Building: Performing Arts Center
Site: St Cloud State Part 2

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
11	AHU F14 Scheduling	$1,380	$927	1.49	$0	1.49	11
1	AHU F1 scheduling is excessive	$1,380	$186	7.43	$0	7.43	2
3	AHU F7 scheduling is excessive	$1,380	$130	10.58	$0	10.58	2
	Total for Findings with Payback 3 years or less:	**$1,380**	**$927**	**1.49**	**$0**	**1.49**	**11**
	Total for all Findings:	**$4,140**	**$1,243**	**3.33**	**$0**	**3.33**	**15**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Performing Arts Center

FWB Number:	11656	Eco Number:	1
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	AHU F1 scheduling is excessive	Date Identified:	11/15/2011
Description of Finding:	AHU is scheduled to run 6:00-22:00 on weekdays and 10:00-22:00 on weekends. Unit was also on during labor day.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff	Benefits:	Energy Savings
Baseline Documentation Method:	AHU F1 supply fan status trends indicate the designated schedule. (File: PAC Trends - Fans.xlsx; Tab: F1)		
Measure:	Reduce operating schedule of F1		
Recommendation for Implementation:	AHU F1 shall be scheduled ON from 7:00-22:00 Monday thru Friday and 10:00-22:00 Saturday and Sunday. Eliminate or reduce occupied schedule during holidays.		
Evidence of Implementation Method:	Trend the Supply Fan F1 and Return Fan F2 fan statuses at 15 minute intervals for 2 weeks. Analyze the data and verify that the fans operate according to the revised schedule.		

Annual Electric Savings (kWh):	2,706	Contractor Cost ($):	$138
Estimated Annual kWh Savings ($):	$186	PBEEEP Provider Cost for Implementation Assistance ($):	$1,242
		Total Estimated Implementation Cost ($):	$1,380

Estimated Annual Total Savings ($):	$186	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	7.43	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	7.43	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	2	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	2.1%	Percent of Implementation Costs:	4.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Performing Arts Center

FWB Number:	11656	Eco Number:	3
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	AHU F7 scheduling is excessive	Date Identified:	2/6/2012
Description of Finding:	AHU F7 is scheduled to run 7:00 to 20:30 Monday thru Saturday and 10:00-20:30 on Sunday. AHU F7 shall be scheduled to run 8:00-19:30 Monday thru Saturday and 10:00-19:30 Sunday.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff	Benefits:	Energy Savings
Baseline Documentation Method:	BAS Trends of AHU F7 supply and return fan VFD status indicated the designated schedule. (File: PAC Trends - Fans.xlsx; Tab: F7)		
Measure:	Reduce operating schedule of F7		
Recommendation for Implementation:	AHU F7 shall be scheduled ON from 8:00-19:30 Monday thru Saturday and 10:00-19:30 Sunday. AHU F7 shall be scheduled OFF on holidays.		
Evidence of Implementation Method:	Trend the Supply Fan F7 and Return Fan F8 fan statuses at 15 minute intervals for 2 weeks. Analyze the data and verify that the fans operate according to the revised schedule.		

Annual Electric Savings (kWh):	1,900	Contractor Cost ($):	$138
Estimated Annual kWh Savings ($):	$130	PBEEEP Provider Cost for Implementation Assistance ($):	$1,242
		Total Estimated Implementation Cost ($):	$1,380

Estimated Annual Total Savings ($):	$130	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	10.58	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	10.58	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	2	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	1.5%	Percent of Implementation Costs:	4.0%

Findings Details

Building: Performing Arts Center

FWB Number:	11656	Eco Number:	11
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	AHU F14 Scheduling	Date Identified:	11/21/2011
Description of Finding:	AHU F14 is scheduled from 7:00 to 17:00. AHU F14 should be scheduled as the Center Stage area is needed or occupied.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	In-House Staff	Benefits:	Energy Savings
Baseline Documentation Method:	Trends for AHU F14 supply fan VFD and supply fan status indicate the designated schedule. (File: PAC Trends - Fans.xlsx; Tab: F14)		
Measure:	Reduce operating schedule of F14		
Recommendation for Implementation:	AHU F14 shall be scheduled ON only during times where the Center Stage is occupied.		
Evidence of Implementation Method:	Trend the Supply Fan F14 fan status at 15 minute intervals for 2 weeks. Analyze the data and verify that the fan operates according to the revised schedule.		

Annual Electric Savings (kWh):	10,446	Annual Natural Gas Savings (therms):	332
Estimated Annual kWh Savings ($):	$717	Estimated Annual Natural Gas Savings ($):	$210
Contractor Cost ($):	$138		
PBEEEP Provider Cost for Implementation Assistance ($):	$1,242		
Total Estimated Implementation Cost ($):	$1,380		

Estimated Annual Total Savings ($):	$927	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	1.49	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	1.49	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	11	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	10.7%	Percent of Implementation Costs:	4.0%

Findings Summary

Building: Stewart Hall
Site: St Cloud State Part 2

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	VFDs do not modulate	$9,540	$1,097	8.70	$0	8.70	11
	Total for Findings with Payback 3 years or less:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**
	Total for all Findings:	**$9,540**	**$1,097**	**8.70**	**$0**	**8.70**	**11**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Stewart Hall

FWB Number:	11657	Eco Number:	1
Site:	St Cloud State Part 2	Date/Time Created:	8/24/2012

Investigation Finding:	VFDs do not modulate	Date Identified:	6/25/2012
Description of Finding:	SF-1 and 5 fan VFDs do not modulate or not sufficiently. Testing of a sampling of the pneumatic VAV boxes throughout the facility showed that the boxes are functional and modulate to 30-50% of max flow when the thermostat is manipulated. Despite this, the air handling units still do not modulate.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Controls (Setpoint Changes)
Finding Type:	Fan Speed Doesn't Vary Sufficiently		

Implementer:	Test and Balance Contractor	Benefits:	Reduced reheating and cooling resulting in kWh and therm savings
Baseline Documentation Method:	Trend data of SF-1 and 5 fan VFDs, OAT. The VFD speeds can be seen varying slightly or not at all as the space load changes.		
Measure:	Load Calcs/Test and Balance		
Recommendation for Implementation:	Re-calculate building loads for SF-1 and 5 and re-balance the airside according to the current cooling loads.		
Evidence of Implementation Method:	Trend the supply and return fan VFD speeds for SF-1 and SF-5 and the OAT at 15 minute intervals for two weeks in the summer, shoulder season, and winter. The VFD speeds should observed decreasing as the OAT decreases.		

Annual Electric Savings (kWh):	6,916	Annual Natural Gas Savings (therms):	985
Estimated Annual kWh Savings ($):	$475	Estimated Annual Natural Gas Savings ($):	$622
Contractor Cost ($):	$8,740		
PBEEEP Provider Cost for Implementation Assistance ($):	$800		
Total Estimated Implementation Cost ($):	$9,540		

Estimated Annual Total Savings ($):	$1,097	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	8.70	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	8.70	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	11	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	12.7%	Percent of Implementation Costs:	27.4%

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

11651 - SCSU- 51 Bldg and Wing

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive			Investigation looked for, but did not find this issue.	
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	FWB-3	AHU-1	Investigation looked for, but did not find this issue.	freeze protection limits too high
	a.3 (3)	Lighting is on more hours than necessary.			Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling			Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)			Investigation looked for, but did not find this issue.	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.			Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads			Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	FWB-1	AHU-1		Perimeter radiation out of control
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement			Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints			Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls			Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.			Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.			Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently			Investigation looked for, but did not find this issue.	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently			Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary			Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)			Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	FWB-4	AHU-1	Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	FWB-5	AHU-1	Investigation looked for, but did not find this issue.	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)			Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit			Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled			Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping			Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.			Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			Investigation looked for, but did not find this issue.	
	g.1 (28)	VFD Retrofit - Fans			Investigation looked for, but did not find this issue.	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

11651 - SCSU- 51 Bldg and Wing

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps			Not cost-effective to investigate	
	g.3 (30)	VFD Retrofit - Motors (process)			Investigation looked for, but did not find this issue.	
	g.4 (31)	OTHER_VFD			Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors			Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers			Not Relevant	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers			Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating			Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps			Investigation looked for, but did not find this issue.	
	h.7 (38)	Retrofit - Equipment (custom)			Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method			Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery			Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)			Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting			Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope			Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy			Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit			Investigation looked for, but did not find this issue.	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard			Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination			Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper			Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	FWB-2	AHU-1, VAV-002		VAV reheat valve failure
	i.5 (48)	OTHER_Maintenance			Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER			Investigation looked for, but did not find this issue.	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

11652 - SCSU- Education Building

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive			Investigation looked for, but did not find this issue.	Includes AHU's S-1, S-2, S-3
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	HW Reheat pumps run continuously during coolling season.	HW Reheat Pump		HW Reheat Pump
	a.3 (3)	Lighting is on more hours than necessary.			Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling			Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)			Investigation looked for, but did not find this issue.	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.			Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads			Not Relevant	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive			Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement			Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints			Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	Space temperature in room A148 (AHU S-3) is high. It ranges from 69F to 81F during occupied periods.	Data loggers		
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.			Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.			Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently			Not Relevant	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently			Not Relevant	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary			Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)			Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.6 (22)	Other_Controls (Reset Schedules)			Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit			Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled			Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping			Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.			Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			Investigation looked for, but did not find this issue.	

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11652 - SCSU- Education Building

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.1 (28)	VFD Retrofit - Fans	Install VFD's on supply and return fans	AHU's		Includes AHU's S-1, S-2, S-3
	g.2 (29)	VFD Retrofit - Pumps	Install VFD on HW reheat pump	HW rehear pump.		HW reheat pump.
	g.3 (30)	VFD Retrofit - Motors (process)			Not Relevant	
	g.4 (31)	OTHER_VFD			Not Relevant	
h. Retrofits:	h.1 (32)	Retrofit - Motors			Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers			Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers			Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating			Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps			Investigation looked for, but did not find this issue.	
	h.7 (38)	Retrofit - Equipment (custom)			Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method			Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery			Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)			Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting			Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope			Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy			Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit			Investigation looked for, but did not find this issue.	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard			Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination			Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper			Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve			Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance			Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER			Investigation looked for, but did not find this issue.	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

11653 - SCSU- Eng/Comp Ctr

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	AHU S-1, S-2, S-4, and S-5 are all over occupied	S-1, S-2, S-4, S-5		AHU's are scheduled on when not needed.
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	AHU S-1, S-2, S-4, and S-5 are all over occupied	S-1, S-2, S-4, S-5		AHU's are scheduled on when not needed.
	a.3 (3)	Lighting is on more hours than necessary.			Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling			Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)			Investigation looked for, but did not find this issue.	OA dampers were fully closed when the OAT was above 70°F.
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.			Investigation looked for, but did not find this issue.	OA dampers were fully closed when the OAT was above 70°F.
	b.3 (7)	OTHER_Economizer/OA Loads			Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive			Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	MAT sensor for S-3	S-3		S-3 MAT sensor needs replacement or calibration.
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints			Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls			Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.			Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.			Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	AHU S-4 Return fan minimum is too high	S-4		S-4 return fan minimum is set at 65%.
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently			Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary			Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)			Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.6 (22)	Other_Controls (Reset Schedules)			Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit			Not Relevant	
	f.2 (24)	Pump Discharge Throttled			Not Relevant	
	f.3 (25)	Over-Pumping			Not Relevant	
	f.4 (26)	Equipment is oversized for load.			Not Relevant	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			Investigation looked for, but did not find this issue.	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

11653 - SCSU- Eng/Comp Ctr

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.1 (28)	VFD Retrofit - Fans			Investigation looked for, but did not find this issue.	
	g.2 (29)	VFD Retrofit - Pumps			Investigation looked for, but did not find this issue.	
	g.3 (30)	VFD Retrofit - Motors (process)			Not Relevant	
	g.4 (31)	OTHER_VFD			Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors			Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers			Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers			Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating			Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps			Investigation looked for, but did not find this issue.	
	h.7 (38)	Retrofit - Equipment (custom)			Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method			Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery			Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)			Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting			Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope			Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy			Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit			Investigation looked for, but did not find this issue.	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard			Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination			Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper			Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve			Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance			Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER			Investigation looked for, but did not find this issue.	

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

11654 - SCSU- Kiehle Visual Arts

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive			Investigation looked for, but did not find this issue.	
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	FWB-1 and FWB-2	S-2,3		perimeter radiation over heating, and freeze protection
	a.3 (3)	Lighting is on more hours than necessary.			Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling			Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)			Investigation looked for, but did not find this issue.	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.			Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads			Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive			Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement			Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints			Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls			Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.			Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.			Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	FWB-1	S-1,2,3		
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently			Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	FWB-3	S-1,2,3		VAV to be rebalanced
	d.6 (17)	Other_Controls (Setpoint Changes)			Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)			Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit			Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled			Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping			Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.			Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			Investigation looked for, but did not find this issue.	
	g.1 (28)	VFD Retrofit - Fans			Not Relevant	VFDs already installed

PBEEEP State Government

Rev. 2.0 (12/16/2010)

11654 - SCSU- Kiehle Visual Arts

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps			Not Relevant	VFDs already installed
	g.3 (30)	VFD Retrofit - Motors (process)			Not Relevant	VFDs already installed
	g.4 (31)	OTHER_VFD			Not Relevant	
h. Retrofits:	h.1 (32)	Retrofit - Motors			Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers			Not Relevant	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			Not Relevant	
	h.4 (35)	Retrofit - Boilers			Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating			Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps			Not Relevant	
	h.7 (38)	Retrofit - Equipment (custom)			Not Relevant	
	h.8 (39)	Retrofit - Pumping distribution method			Not Relevant	
	h.9 (40)	Retrofit - Energy/Heat Recovery			Not Relevant	
	h.10 (41)	Retrofit - System (custom)			Not Relevant	
	h.11 (42)	Retrofit - Efficient Lighting			Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope			Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy			Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit			Investigation looked for, but did not find this issue.	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard			Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination			Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper			Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	FWB-2	S-2,3		Freeze protection
	i.5 (48)	OTHER_Maintenance			Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER			Investigation looked for, but did not find this issue.	

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11656 - SCSU- Performing Arts

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	AHU occupancy schedule can be reduced	BAS Trends		Includes F1, F5, F7, F14
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	AHU's VFD is enabled while off	BAS Trends		
	a.3 (3)	Lighting is on more hours than necessary.			Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling			Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	Economizer enable temperature setpoint needs adjustment	BAS Trends		Includes F14, F15
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position, Minimum outside air fraction not set to design specifications or occupancy.			Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	1) OA Damper is only open during economizer mode	1) BAS Trends		1) Includes F14
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive			Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	1) Sensor spikes in value 2) Sensor is Broken	1) Trends 2) Trends		Some sensors are suspected to be out of calibration or no longer able to function properly. These sensors have been listed in the Data input tab as findings. Includes airflow sensor for VAV-41, Duct Static Pressure Sensor for AHUs F7 & F10, Humidity Valve Position for AHU F16
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	AHU's VFD does not vary sufficiently AHU's VFD overshoots	Trends		Includes F14 Includes F14
	c.4 (11)	OTHER_Controls			Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.			Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.			Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	Fan speeds do not vary sufficiently during occupied times. Heating season low VFD speeds are over 80%.	Trends		F14, F7, F8
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently			Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	Some pnuematic actuators suspected to be failing.	Testing on site		A sample of classroom and office diffusers were tested with a flow hood to determine current conditions in winter season. T-stat was then manipulated to simulate a call for cooling (minimal increase in CFM/diffuser). The Tstat was then manipulated to simulate a call for heating with minimal decrease in CFM. Recommend large capital improvement project to replace VAVs and associated equipment.
	d.6 (17)	Other_Controls (Setpoint Changes)			Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.6 (22)	Other_Controls (Reset Schedules)			Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit			Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled			Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping			Investigation looked for, but did not find this issue.	

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Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
	f.4 (26)	Equipment is oversized for load.			Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			Investigation looked for, but did not find this issue.	
g. Variable Frequency Drives (VFD):	g.1 (28)	VFD Retrofit - Fans			Investigation looked for, but did not find this issue.	
	g.2 (29)	VFD Retrofit - Pumps			Investigation looked for, but did not find this issue.	
	g.3 (30)	VFD Retrofit - Motors (process)			Investigation looked for, but did not find this issue.	
	g.4 (31)	OTHER_VFD			Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors			Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers			Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers			Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating			Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps			Investigation looked for, but did not find this issue.	
	h.7 (38)	Retrofit - Equipment (custom)			Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method			Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery			Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)			Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting			Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope			Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy			Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit			Investigation looked for, but did not find this issue.	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard			Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination			Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper			Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve			Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance			Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER			Investigation looked for, but did not find this issue.	

Investigation Checklist

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11657 - SCSU- Stewart Hall

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive			Investigation looked for, but did not find this issue.	
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	FWB-3	SF-3,4,5		
	a.3 (3)	Lighting is on more hours than necessary.			Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling			Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)			Investigation looked for, but did not find this issue.	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.			Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads			Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive			Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	FWB-4,5,6	SF-6,7, Chiller		Mismapped thermostats, and chiller enable trend
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints			Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls			Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.			Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.			Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	FWB-1	SF-1,2,3,4,5		
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently			Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary			Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)			Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	FWB-2	SF-1,2,3,4,5		
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			Investigation looked for, but did not find this issue.	
	e.6 (22)	Other_Controls (Reset Schedules)			Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit			Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled			Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping			Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.			Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			Investigation looked for, but did not find this issue.	
	g.1 (28)	VFD Retrofit - Fans			Not cost-effective to investigate	SF-1,2,3,4,5 have VFDs, S-6,7,8 not cost effective for retrofit

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Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps			Investigation looked for, but did not find this issue.	
	g.3 (30)	VFD Retrofit - Motors (process)			Investigation looked for, but did not find this issue.	
	g.4 (31)	OTHER_VFD			Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors			Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers			Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers			Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating			Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps			Investigation looked for, but did not find this issue.	
	h.7 (38)	Retrofit - Equipment (custom)			Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method			Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery			Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)			Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting			Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope			Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy			Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit			Investigation looked for, but did not find this issue.	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard			Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination			Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper			Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve			Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance			Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER			Investigation looked for, but did not find this issue.	

Investigation Checklist

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11655 - SCSU- Parking Ramp

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive			Investigation looked for, but did not find this issue.	
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive			Investigation looked for, but did not find this issue.	
	a.3 (3)	Lighting is on more hours than necessary.			Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling			Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)			Not Relevant	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.			Not Relevant	
	b.3 (7)	OTHER_Economizer/OA Loads			Not Relevant	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive			Not Relevant	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement			Not Relevant	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints			Not Relevant	
	c.4 (11)	OTHER_Controls			Not Relevant	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.			Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.			Not Relevant	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently			Not Relevant	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently			Not Relevant	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary			Not Relevant	
	d.6 (17)	Other_Controls (Setpoint Changes)			Not Relevant	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal			Not Relevant	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			Not Relevant	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal			Not Relevant	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal			Not Relevant	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)			Not Relevant	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit			Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled			Not Relevant	
	f.3 (25)	Over-Pumping			Not Relevant	
	f.4 (26)	Equipment is oversized for load.			Not Relevant	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			Not Relevant	
	g.1 (28)	VFD Retrofit - Fans			Not Relevant	

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11655 - SCSU- Parking Ramp

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps			Not Relevant	
	g.3 (30)	VFD Retrofit - Motors (process)			Not Relevant	
	g.4 (31)	OTHER_VFD			Not Relevant	
h. Retrofits:	h.1 (32)	Retrofit - Motors			Not Relevant	
	h.2 (33)	Retrofit - Chillers			Not Relevant	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			Not Relevant	
	h.4 (35)	Retrofit - Boilers			Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating			Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps			Not Relevant	
	h.7 (38)	Retrofit - Equipment (custom)			Not Relevant	
	h.8 (39)	Retrofit - Pumping distribution method			Not Relevant	
	h.9 (40)	Retrofit - Energy/Heat Recovery			Not Relevant	
	h.10 (41)	Retrofit - System (custom)			Not Relevant	
	h.11 (42)	Retrofit - Efficient Lighting			Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope			Not Relevant	
	h.13 (44)	Retrofit - Alternative Energy			Not Relevant	
	h.14 (45)	OTHER_Retrofit			Not Relevant	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard			Not Relevant	
	i.2 (47)	Impurity/Contamination			Not Relevant	
	i.3 ( )	Leaky/Stuck Damper			Not Relevant	
	i.4 ( )	Leaky/Stuck Valve			Not Relevant	
	i.5 (48)	OTHER_Maintenance			Not Relevant	
j. OTHER	j.1 (49)	OTHER			Not Relevant	

Deleted Findings Report

FWB Number:	11651	Eco #:	1	Building:	51 Bldg
Investigation Finding:	Perimeter Radiation Over-Heating		Equipment or System(s):	AHU with heating and cooling	
Measure:	Install DDC Perimeter Radiation Control. Estimated annual savings of $2,099; estimated implementation cost of $35,760.				

FWB Number:	11651	Eco #:	3	Building:	51 Bldg
Investigation Finding:	Coil Freeze Protection Limit Too High		Equipment or System(s):	AHU with heating and cooling	
Measure:	Enable Freeze Protection when Temps are below 35 degrees. Estimated annual savings of $2; estimated implementation cost of $1,380.				

FWB Number:	11652	Eco #:	2	Building:	Education Bldg
Investigation Finding:	Room A148 Space temp - NO ENERGY SAVINGS. DELETE		Equipment or System(s):	VAV terminal unit	
Measure:					

FWB Number:	11652	Eco #:	3	Building:	Education Bldg
Investigation Finding:	HW Reheat pump runtime is excessive		Equipment or System(s):	Pump, HW distribution	
Measure:	Turn HW reheat pumps off when outside air temperature is above 75oF. Estimated annual savings of $89; estimated implementation cost of $1,500.				

FWB Number:	11652	Eco #:	4	Building:	Education Bldg
Investigation Finding:	HW Reheat pump does not have VFD control		Equipment or System(s):	Pump, HW distribution	
Measure:	Provide and install a VFD on the HW reheat pump. Estimated annual savings of $330; estimated implementation cost of $6,560.				

FWB Number:	11652	Eco #:	5	Building:	Education Bldg
Investigation Finding:	Supply and Return fans for AHU-1, 2, and 3 do not have VFD control.		Equipment or System(s):	AHU with cooling only	
Measure:	Provide and install a VFD on the AHU fans. Modify controls of AHU's. Estimated payback exceeds 15				

	years. This measure requires significant rework, including changing the recommendation.

FWB Number:	11652	Eco #:	6	Building:	Education Bldg
Investigation Finding:	AHU 1, 2, & 3 economizer control		Equipment or System(s):	AHU with cooling only	
Measure:	AHU outside air damper control setpoints are not optimized. Estimated annual savings of $1,685; estimated implementation cost of $5,180.				

FWB Number:	11653	Eco #:	2	Building:	Engineering/Computing Center
Investigation Finding:	Abu S-1 Return Fan VFD scheduling		Equipment or System(s):	AHU with cooling only	
Measure:	Return Fan VFD runs after the AHU is shut down. Estimated annual savings of $8; estimated implementation cost of $810.				

FWB Number:	11653	Eco #:	3	Building:	Engineering/Computing Center
Investigation Finding:	AHU Scheduling (S-1, S-2, S-3, S-5, S-6)		Equipment or System(s):	AHU with cooling only	
Measure:	Occupancy Schedule. Estimated annual savings of $105 estimated implementation cost of $4,030.				

FWB Number:	11653	Eco #:	5	Building:	Engineering/Computing Center
Investigation Finding:	AHU S-4 minimum Return fan VFD setting		Equipment or System(s):	AHU with cooling only	
Measure:	Return fan VFD speed. Estimated annual savings of $38; estimated implementation cost of $1,656.				

FWB Number:	11654	Eco #:	1	Building:	Kiehle Visual Arts
Investigation Finding:	Perimeter Radiation over-heating		Equipment or System(s):	AHU with heating and cooling	
Measure:	Install DDC Perimeter Radiation Control. Estimated annual savings of $877; estimated implementation cost of $40,940.				

FWB Number:	11654	Eco #:	2	Building:	Kiehle Visual Arts
Investigation Finding:	Coil Freeze protection limit too high		Equipment or System(s):	AHU with heating and cooling	

Measure:	Enable Freeze Protection when Temps are below 35 degrees. The estimated annual savings for this measure is $0.

FWB Number:	11654	Eco #:	3	Building:	Kiehle Visual Arts
Investigation Finding:	VAV boxes not modulating sufficiently		Equipment or System(s):	VAV terminal unit	
Measure:	Rebalance VAV boxes. Estimated annual savings of $741; estimated implementation cost of $11,610.				

FWB Number:	11656	Eco #:	2	Building:	Performing Arts Center
Investigation Finding:	AHU F1 is not controlled by VFD's		Equipment or System(s):	AHU with cooling only	
Measure:	Provide VFD control for supply and return fans. Estimated payback exceeds 15 years. This measure requires significant rework, including changing the recommendation.				

FWB Number:	11656	Eco #:	4	Building:	Performing Arts Center
Investigation Finding:	AHU F7 Economizer Control		Equipment or System(s):	AHU with cooling only	
Measure:	AHU F7 outside air damper control setpoints are not optimized. Estimated annual savings of $19; estimated implementation cost of $2,881.				

FWB Number:	11656	Eco #:	5	Building:	Performing Arts Center
Investigation Finding:	VFD control on AHU F7 Supply Fan and F8 Return Fan is inadequate		Equipment or System(s):	AHU with cooling only	
Measure:	Supply Fan F7 and Return Fan F8 VFD control does not modulate. Estimated annual savings of $188; estimated implementation cost of $3,726.				

FWB Number:	11656	Eco #:	6	Building:	Performing Arts Center
Investigation Finding:	AHU F7 space static pressure sensor needs calibration/replacement.		Equipment or System(s):	AHU with cooling only	
Measure:	Trends of AHU F7 space static pressure sensors are reading reasonable and accurate pressure levels. Estimated implementation cost of $965.				

FWB Number:	11656	Eco #:	7	Building:	Performing Arts Center
Investigation Finding:	AHU F7 duct static pressure sensor needs calibration/replacement.		Equipment or System(s):	AHU with cooling only	
Measure:	Trends of AHU F7 duct static pressure sensors are reading reasonable and accurate pressure levels.				

	Estimated implementation cost of $965.

FWB Number:	11656	Eco #:	8	Building:	Performing Arts Center
Investigation Finding:	AHU F10 space static pressure sensor needs calibration/replacement.		Equipment or System(s):	AHU with cooling only	
Measure:	Trends of AHU F10 space static pressure sensors are reading reasonable and accurate pressure levels. Estimated implementation cost of $965.				

FWB Number:	11656	Eco #:	9	Building:	Performing Arts Center
Investigation Finding:	AHU F10 duct static pressure sensor needs calibration/replacement.		Equipment or System(s):	AHU with cooling only	
Measure:	Trends of AHU F10 duct static pressure sensors are reading reasonable and accurate pressure levels. Estimated implementation cost of $965.				

FWB Number:	11656	Eco #:	10	Building:	Performing Arts Center
Investigation Finding:	AHU F10 DAT hunts to maintain setpoint.		Equipment or System(s):	AHU with heating and cooling	
Measure:	Trend data for the discharge air temperature indicates that the AHU is not maintaining setpoint without hunting. Estimated annual savings of $23; estimated implementation cost of $1,271.				

FWB Number:	11656	Eco #:	12	Building:	Performing Arts Center
Investigation Finding:	AHU F14 Economizer Control		Equipment or System(s):	AHU with heating and cooling	
Measure:	AHU F14 outside air damper control setpoints are not optimized. Estimated annual savings of $68; estimated implementation cost of $2,881.				

FWB Number:	11656	Eco #:	13	Building:	Performing Arts Center
Investigation Finding:	AHU F14's VFD does not vary sufficiently		Equipment or System(s):	AHU with heating and cooling	
Measure:	Trending for the AHU indicated that the Supply fan VFD varies and does not stay at certain values such as 80%, 90%, etc… Estimated annual savings of $91; estimated implementation cost of $4,490.				

FWB Number:	11656	Eco #:	14	Building:	Performing Arts Center
Investigation Finding:	AHU F15 Economizer Control		Equipment or System(s):	AHU with heating and cooling	
Measure:	Trends for the OAT and OA Damper indicate that the AHU goes into economizer mode at 55F and below. Estimated annual savings of $65; estimated implementation cost of $2,881.				

FWB	11656	Eco #:	15	Building:	Performing Arts Center

Number:					
Investigation Finding:	AHU F15 Scheduling is excessive		Equipment or System(s):	AHU with heating and cooling	
Measure:	Trends for supply fan status indicate that the unit is off or running at reduced hours during holidays. Estimated annual savings of $82; estimated implementation cost of $1,500.				

FWB Number:	11657	Eco #:	2	Building:	Stewart Hall
Investigation Finding:	Duct Static Pressure Reset Schedule		Equipment or System(s):	AHU with heating and cooling	
Measure:	Install DDC VAV Boxes and Program Duct Static Reset based on building load. Estimated annual savings of $3,792; estimated implementation cost of $623,300.				

FWB Number:	11657	Eco #:	3	Building:	Stewart Hall
Investigation Finding:	Coil Freeze Protection Limit too High		Equipment or System(s):	AHU with heating and cooling	
Measure:	Enable Freeze Protection when Temps are below 35 degrees. Estimated annual savings of $39; estimated implementation cost of $1,490.				

FWB Number:	11657	Eco #:	4	Building:	Stewart Hall
Investigation Finding:	S-7 thermostat mis-mapped in controls		Equipment or System(s):	Other	
Measure:	Set S-6 thermostat controls point to control S-6. Estimated annual savings of $0; estimated implementation cost of $1,150.				

FWB Number:	11657	Eco #:	5	Building:	Stewart Hall
Investigation Finding:	S-6 thermostat mis-mapped in controls		Equipment or System(s):	Other	
Measure:	Set S-7 thermostat control point to control S-7. Estimated annual savings of $0; estimated implementation cost of $1,150.				

414 Nicollet Mall, GO-6
Minneapolis, MN 55401

1-800-481-4700
xcelenergy.com

November 9, 2011

Saint Cloud State University PBEEEP
Tim Norton
720 4th Ave S
St. Cloud, MN 56301

Dear **Tim**:

Thank you for participating in Xcel Energy's Recommissioning program. We have reviewed your study application and proposal and have preapproved your study. The following outlines your rebate and project information:

Building Address	**51 Building; 51 Building Wing; Education Bldg; Engineering; Kiehl Visual Arts; Parking Ramp; Performing Arts; Stewart**		
Study Cost	$124,750	Study Number	RM1700
Preapproved study rebate*	**$62,525**		
* Your rebate was based on the study cost provided. If the final study cost is lower, your rebate will be adjusted accordingly.			
Study Provider	**Sebesta Blomberg**		
Account manager	**Scott Hinde** Phone **320-269-7862**		

Here's a quick review of the Recommissioning program process:

- Once your study is complete, your study provider will send a draft copy to us for review.
- After we complete our review and approve the study, we will send you a confirmation letter noting our approval.
- Your study provider will schedule a wrap-up meeting with you and your Xcel Energy account manager to go over the results of the study.
- You pay the study provider for the full cost of the study.
- You submit the Recommissioning Study Rebate Application, along with a copy of the invoice and your Customer Implementation Plan, to us within 3 months of your report presentation. Please work with your account manager to complete the Customer Implementation Plan.
- We'll send your study rebate check to you.

414 Nicollet Mall, GO-6
Minneapolis, MN 55401

1-800-481-4700
xcelenergy.com

Please note that we need to approve the final study in order to receive your study rebate.

This study pre-approval is valid for **3 months** from the date of this letter. If your study will take longer than that, please let us know. If you have any questions or comments, please call your assigned Xcel Energy account manager. Thanks again for participating in our Recommissioning program.

Sincerely,

Alex Birkholz
Marketing Assistant, Recommissioning

Attachment

CC: Scott Hinde - Xcel Energy
Sherryl Volkert - Xcel Energy
Tim Kempf – Sebesta Blomberg

STATE OF MINNESOTA
INTERAGENCY AGREEMENT
AMENDMENT #2

This amendment is by and between the **MINNESOTA DEPARTMENT OF ADMINISTRATION** and **ST. CLOUD STATE UNIVERSITY.**

Recitals

1. The Department of Administration has an Interagency Agreement with St. Cloud State University identified as contract number 34787350 (”Original Agreement”) to provide PBEEEP Energy Engineering Services.

2. This Agreement is being amended to indicate St. Cloud State University will pay the vendor (Trane U.S., Inc.) for the upgrade and trending work and the Department of Administration will reimburse St. Cloud State University upon receipt of an invoice from them.

3. The Minnesota Department of Administration (“Admin”) and St. Cloud State University (SCSU) are willing to amend the Original Contract as stated below.

Contract Amendment

REVISION 1. Clause 2. **“Scope of Work”** is amended as follows:
The **MINNESOTA DEPARTMENT OF ADMINISTRATION** (“Admin”) will:

- Admin agrees to reimburse SCSU up to $18,771.00 for update of the Building Automation System (“Part 2” Project) upon receipt of an invoice from SCSU.
- Admin agrees to reimburse SCSU up to $8,090.00 for trending to be set up on the Building Automation System (“Part 2” Project) upon receipt of an invoice from SCSU.

Except as amended herein, the terms and conditions of the Original Contract and all previous amendments remain in full force and effect.

1. STATE ENCUMBRANCE VERIFICATION

*Individual certifies that funds have been encumbered as required by Minn. Stat. §§*16A.15 and 16C.05.

Signed: _____
Debra Nordling

Date: _____

CFMS Contract No. A- _____ Object Code: _____

2. Minnesota department of Administration

By: _____
Wayne Waslaski *(with delegated authority)*

Date: _____

Title: _____

3. St. Cloud State University

By: _____
John Frischmann *(with delegated authority)*

Title: _____

Date: _____

PBEEEP
State Government

Public Buildings Enhanced Energy Efficiency Program

SCREENING RESULTS FOR
SAINT CLOUD STATE UNIVERSITY

October 12, 2010

Campus Overview

Saint Cloud State University	
Location	740 4th Avenue South St. Cloud, MN 56301
Facility Manager	John Frischmann, Acting Buildings and Grounds Director
Number of Buildings	56
Interior Square Footage	3,136,612
PBEEEP Provider	Center for Energy and Environment (Angela Vreeland and Neal Ray)
Date Visited	3/23/2010
State Project Manager	John Frischmann
Annual Energy Cost	$3,767,766 (from 2009 utility data)
Utility Company	Xcel Energy (natural gas and electricity) Tex-Par Oil and First Fuel Banks (fuel oil) Ferrellgas (propane)
Site Energy Use Index (EUI)	110 kBtu/sqft (B3 data for 2009)
Benchmark EUI (from B3)	130 kBtu/sqft

Saint Cloud State University (SCSU) is comprised of 56 buildings ranging in size from 600 to 235,000 interior square feet. The total area of the buildings on the campus is 3,136,612 square feet. The campus has twenty office and/or classroom buildings, twelve apartments or dormitories, an art center, a bus station, a cafeteria, two maintenance buildings, two greenhouses, a gym and recreational facility, a hockey center, a library, a heating plant, a chilled water plant, a parking ramp, a science and research building, a stadium, a student center, and a public safety building. Some of the buildings are attached to other buildings or are additions to buildings, but for the most part the buildings are detached. All of the buildings are located on campus, covering an area approximately five blocks wide by twelve blocks long. There is a map of the campus showing the location of each building within the site at the end of this report.

Screening Overview

The goal of screening is to select buildings where an in-depth energy investigation can be performed to identify energy savings opportunities that will generate savings with a relatively short (1 to 5 years) and certain payback. The screening of SCSU was performed by the Center for Energy and Environment (CEE) with the assistance of the facility staff. A walk-through was conducted on March 23, 2010 and interviews with the facility staff were carried out over a period of several months to fully explore the status of the energy consuming equipment and their potential for recommissioning. This report is the result of that information.

Recommendation

Due to the large size of the campus, it is recommended that the campus be divided into more than one group of buildings for the investigation phase of the PBEEEP process. The buildings have been grouped in the following manner:

Current Group- The buildings in this group are currently being recommended for investigation.

- ***Phase 1 (10 buildings, 881,579 ft^2)***

  This group includes buildings that were determined to have good potential for reducing energy use and/or have operational issues that the building staff would like addressed.

Future Groups- The remaining buildings are divided into three categories:

- ***Good (8 buildings, 726,488 ft^2)***

  As with Phase 1 buildings, these buildings have good potential for reducing energy use and will most likely be included in future investigation group(s).

- ***Potential (19 buildings, 1,243,379 ft^2)***

  These buildings have potential for reducing energy use and may or may not be included in future investigation group(s). All of the dormitories are listed in this list except for Mitchell Hall, which is in Phase 1. Dormitories will be included in future groups depending on the results of the investigation of Mitchell Hall.

- ***Poor (19 buildings, 285,166 ft^2)***

  These buildings are not recommended for investigation for a number of reasons. For the most part, these buildings are relatively small, have few pieces of HVAC equipment, and have limited automation. Eastman Hall, which is the only sizeable building in this group, is going to be taken out of service.

Each of the groups will include buildings that total one million interior square feet or less; consequently, there will be two or three building groups investigated through PBEEEP. The following tables list the buildings in each of the four groups. The floor areas listed in the tables have not been verified.

Phase 1 (10 buildings, 881,579 ft^2)

Building Name	State ID	Building Type	Area (ft^2)	Year Built
Central Chilled Water Plant	E26073S9999	Mechanical	7,590	1999
Garvey Commons	E26073S5562	Cafeteria	50,984	1962
Halenbeck Hall North	E26073S1665	Gymnasium	132,274	1965
Halenbeck Hall South	E26073S1660	Gymnasium	100,000	1980
Heating & Maintenance I	E26073S1050	Mechanical	18,892	1950
James W. Miller LRC	E26073S9600	Library	235,000	2000
Mitchell Hall	E26073S5258	Dormitory	109,784	1958
National Hockey Center	E26073S2889	Hockey Rink	152,055	1989
Recreation Facility	E26073S10104	Recreation Facility	40,000	2005
Stadium Building	E26073S10204	Stadium	35,000	2004

Good Candidates (8 buildings, 726,488 ft^2)

Building Name	State ID	Building Type	Area (ft^2)	Year Built
51 Building	E26073S1868	Academic	52,085	1968
51 Building Wing		Academic	6,150	1993
Education Bldg	E26073S1971	Academic	101,006	1971
Engineering/Computing Center	E26073S1258	Academic	91,840	1958
Kiehle Visual Arts Center	E26073S1152	Art Center	59,984	1952
Parking Ramp	E26073S5709	Parking Ramp	158,798	2008
Performing Arts Center	E26073S1768	Art Center	78,674	1968
Stewart Hall	E26073S0948	Academic	177,951	1948

Potential Candidates – Non dormitory buildings (11 buildings, 859,838 ft^2)

Building Name	State ID	Building Type	Area (ft^2)	Year Built
Administration Service Bldg	E26073S2475	Academic	59,545	1975
Atwood Memorial Center	E26073S8066	Student Center	181,465	1966
Brown Hall	E26073S1358	Academic	78,821	1958
Hill Hall	E26073S5461	Dorm/Health Center	42,342	1962
Centennial Hall	E26073S2071	Academic	165,758	1971
Headley Hall	E26073S1462	Academic	52,898	1962
Lawrence Hall (Dorm/Office)	E26073S10303	Dorm/Academic	29,489	1905
Public Safety Center	E26073S5709	Campus Security	4,879	2008
Riverview Hall	E26073S0211	Academic	28,128	1911
Wick Annex	E26073S2172	Laboratory	38,562	2008
Wick Science Building	E26073S2172	Laboratory	177,951	1948

The decision to recommend a potential candidate building for investigation will be based on current and future plans for building upgrades and uses. The Wick Science complex, for example, is part of a separate energy reduction project that may address many of the same issues as PBEEEP. These buildings will be reevaluated in approximately six months when a second energy study is initiated.

Potential Candidates – Dormitories (8 buildings, 383,541 ft^2)

Building Name	State ID	Building Type	Area (ft^2)	Year Built
Benton Hall North		Dormitory	25,617	1968
Benton Hall South	E26073S6067	Dormitory	35,375	1967
Case Hall	E26073S5663	Dormitory	40,492	1964
Case/Hill Lounge		Lounge		
Holes Hall	E26073S5764	Dormitory	80,213	1965
Lawrence Hall	E26073S10303	Dormitory	13,236	2003
Sherburne Hall	E26073S5967	Dormitory	107,428	1969
Stearns Hall	E26073S5866	Dormitory	81,180	1966

One dormitory, Mitchell Hall, has been recommended for investigation now. The results of that investigation are expected to be directly applicable to the other dorms and will therefore be the basis for recommending any or all of these buildings for investigation.

Poor Candidates (19 buildings, 285,166 ft^2)

Building Name	State ID	Building Type	Area (ft^2)	Year Built
525 Building		Unknown	3,008	1989
801 Building	E26073S2788	Temp. Office	12,100	1988
Alumni House	E26073S0525	Academic	6,108	1925
American Indian Center	E26073S0425	Academic	2,563	1925
Carol Hall	E26073S5126	Academic	13,512	1926
Eastman Hall	E26073S0729	Academic	45,997	1929
Green House 1		Greenhouse	2,258	1992
Green House 2		Greenhouse	600	2004
Husky Hub	E26073S10700	Bus Station	1,198	2000
Maintenance Bldg	E26073S2680	Maintenance	15,392	1980
North Office Center	E26073S0325	Building Grounds	4,002	1925
Richard Green House		Academic	3,764	1935
Shoemaker Hall (old)	E26073S5015	Dormitory	10,184	1915
Shoemaker Hall (east and west)	E26073S5360	Dormitory	115,329	1960
South Office Center	E26073S10495	Academic	2,727	1925
Stateview North	E26073S9702	Apartments	15,358	1992
Stateview South	E26073S9802	Apartments	15,358	2002
Whitney House	E26073S0625	Academic	11,383	1925
Women's Center	E26073S2990	Academic	4,325	1925

Details obtained through the screening process regarding the current and future recommended buildings (all buildings except the "poor" candidates) are included in the following:

Mechanical Equipment

The Heating Plant is located on the southern end of campus and has three steam boilers that serve the entire campus. The boilers supply 115 psi steam year-round. The steam from the Heating Plant is routed to the buildings in underground tunnels and runs through heat exchangers located in each building. The heat exchangers transfer heat from the steam to water that is pumped to the air handlers, fin tube radiation and/or reheats in each building. All of the buildings use steam from the heating plant except for the Central Chilled Water Plant, Parking Ramp, National Hockey Center, and Public Safety Center. These buildings have other heat sources such as a boiler, furnace, unit heater, etc. The Central Chilled Water Plant is located adjacent to the Heating Plant and has two chillers and two cooling towers. There are two primary pumps and two secondary pumps that circulate water throughout the campus to the buildings. Some of the buildings located further from the chilled water plant have their own chilled water pumps that distribute chilled water throughout those buildings. All but fifteen of the buildings use chilled water from the chilled water plant and eight of those buildings are not cooled at all. The following table lists the key mechanical equipment in the buildings recommended for investigation.

Mechanical Equipment Summary Table				
Total	**Phase 1**	**Good**	**Potential**	**Description**
1	1	1	1	Tracer Summit Automation System by Trane
40	10	7	23	Buildings
2,976,959	881,579	567,690	1,527,690	Interior Square Feet
135	62	34	39	Air Handlers
3	3	0	0	Rooftop Units
1,020	259	349	412	VAV Boxes
90	0	0	90	Fan Coil Units
121	39	1	81	Exhaust Fans and Power Roof Ventilators
54	16	10	28	Unit Heaters
7	1	0	6	Make-up Air Units
3	2	1	0	Chillers
2	2	0	0	Cooling Towers
3	3	0	0	Steam Boilers (dual fuel- natural gas or fuel oil)
3	1	0	2	Hot Water Boilers (natural gas)
84	20	20	44	Pumps (HW, CHW, Glycol, or CDW)
40	4	13	23	Heat Exchangers (Steam -HW, HW- Glycol, etc)

Controls and Trending

All buildings that are recommended or potential candidates for investigation are controlled, to some extent, by a Tracer Summit Building Automation System (BAS) by Trane. There are at least nine buildings that have Building Control Unit (BCU) panels that are outdated and have limited memory. These buildings include: Atwood Memorial Center, Centennial Hall, Central Chilled Water Plant, Halenbeck Hall North and South, James W. Miller LRC, Mitchell Hall, Performing Arts Center, Stadium and Recreational Facility, and Stewart Hall. Because the BCU panels for these buildings have little available memory, the equipment in these buildings cannot be trended at this time. The following BCU panels will be upgraded before the Phase 1 investigation begins: Central Chilled Water Plant, Halenbeck

Hall North and South, James W. Miller LRC, and the Stadium and Recreational Facility. Therefore, the automation system will be capable of trending all buildings in Phase 1 before investigation begins. Any remaining outdated BCU panels will need upgrading if they are included in future investigations.

The building staff does not have time to assist with exporting trend data; it is the preference of SCSU that any work on the automation system be performed by a Trane technician and this work will be paid for through a separate contract. The points for each building in the automation system are listed in the building summary tables below.

Lighting

A lighting retrofit was conducted in 1996 throughout the campus, so the majority of indoor lighting is T8 32 watt lamps. Much of the indoor lighting is controlled by occupancy sensors and the outdoor lighting is controlled by the BAS, which operates the lighting based on schedules and photocells. Opportunities for energy savings due to lighting fixture and control improvements may exist.

Energy Use Index B3 Benchmark

The site Energy Use Index (EUI) is 110 kBtu/sqft, which is 15.4% lower than the B3 Benchmark of 130 kBtu/sqft. There is no submetering. The median site EUI for State of Minnesota buildings are 23% lower than their corresponding B3 Benchmarks. This indicates that SCSU has the potential to further reduce its energy use. In addition, because the site is not sub-metered, the performance of individual buildings is not quantified at this time.

Metering

The campus has a total of twenty-eight natural gas meters, twenty-six electrical meters, three fuel oil meters, and one propane meter that are currently active. There are three main electric service entries for the campus which all serve a single campus loop; the service entries allow Xcel energy to balance loads served by three substations. The other electric meters generally serve smaller detached buildings. Similarly there are gas meters that serve kitchen and laboratory areas in addition to the main gas meter. The Public Safety Center and Parking Ramp share a natural gas and electric meter; otherwise none of the buildings are individually metered.

Documentation

There is a significant amount of mechanical documentation, including equipment schedules, renovation prints, balance reports for a few buildings, and control sequences; however, the organization and location of those documents could make finding information difficult. Very little of the documentation is available in electronic form.

Reasons for Recommendations

There are many factors that are part of the decision to recommend an energy investigation of a building; at SCSU the following characteristics were important in the building selection process:

- Square footage
- Level of control by the building automation system
- Equipment size and quantity
- Frequency and severity of comfort and/or control issues
- Support from the staff and management to include specific buildings in an investigation

From a campus-wide standpoint, there are two main reasons for recommending that SCSU move forward with the investigation of a selection of buildings:

- The annual energy cost averages $1.24 per square foot; a reduction in this cost should support the cost of the energy investigation
- B3 data shows that while the campus is below the benchmark value, it is about 14% higher than the average of all buildings in the database.

Building Summary Tables

The following tables are based on information gathered from interviews with facility staff, building walk-throughs, automation system screen-captures, and equipment documentation. The purpose of these tables is to provide the size and quantity of equipment and the level of control present in each building. It is complete and accurate to the best of our knowledge. The summary tables are divided into three groups: Phase 1, Good Candidates, and Potential Candidates. Summary tables are not provided for the Poor Candidates.

Phase 1Buildings

These buildings were determined to be good candidates for an energy investigation and are the first group of buildings recommended to move forward to the investigation phase of PBEEEP.

Central Chilled Water Plant
State ID# E26073S9999

Area (sqft)	7,590	Year Built	1999	Occupancy (hrs/yr)	N/A

HVAC Equipment

Description	Type	Size	Notes
2 Chillers	Centrifugal	204 Tons each	Trane Centravac
2 Cooling Towers		(4) 30 HP motors, 120 HP total	Both towers have VFDs
4 CHW Pumps	Variable Volume with VFDs	2 Primary 40 HP and 2,580 gpm each, 2 Secondary 125 HP and 3,600 gpm each	2 primary loop and 2 secondary loop pumps
2 CDW Pumps	Variable Volume with VFDs	50HP, 2,630 gpm each	
3 Unit Heaters		Unknown	

Points on BAS

Description	Points
Cooling System	Chiller mode (unoccupied/occupied), Restart inhibit timer, CHW entering, CHW leaving, CHW flow, Evaporator approach, CDW entering, CDW leaving, CDW flow, Inlet vane position, Compressor Rated Load Amps (RLA), Oil pressure, OA Enth, Chiller Start Enth, CHW pump status, CHWDP, CHWST, CHWRT, Tower status, Tower speed, Tower isolation valves

Additional Comments

- This is the central chilled water plant that distributes chilled water to the entire campus.
- The unit heaters are the only source of heating for the entire building.

Garvey Commons State ID# E26073S5562					
Area (sqft)	50,984	Year Built	1962	Occupancy (hrs/yr)	5,500

HVAC Equipment

Description	Type	Size	Notes
AHU-1	VAV unit with SF and RF with VFDs	16,700 CFM, 15 HP SF, 3 HP RF	Serves 5 VAV boxes
AHU-2	VAV unit with SF and RF with VFDs	15,400 CFM, 15 HP SF, 3 HP RF	Serves 4 VAV boxes
AHU-3	VAV MAU for kitchen, SF and EF with VFDs	15 HP SF, 10 HP EF	Interlocked with exhaust fan for kitchen
Bakery AHU	Constant Volume	5 HP SF	
AHU-5	VAV SF with VFD	5 HP SF	VFD controlled off space temperature
10 EFs	Constant Volume	EF-10 rated at 3 HP, EF-11 rated at 11 HP. All other under 1 HP	
1 CHWP	Constant Volume	10 HP	
9 VAV boxes			HW reheat coils

Points on BAS

Description	Points
AHU-1 AHU-2	Econ damper, RA damper, Relief damper, Econ damper minimum setpoint, MAT, MAT setpoint, MAT low limit, DAT, DAT setpoint, Duct static, Duct static setpoint, Space static, Space static setpoint, SF status, SF command, SF speed, Cool valve %, Heat valve%, Face bypass damper %, RAT, RA CO2, VAV average temperature, VAV average temperature setpoint, RAT, RF status, RF command, RF speed
AHU-3	OA damper, DAT, DAT setpoint, Space pressure, Space pressure setpoint, SF status, SF command, SF speed, Cool valve, Heat valve, Face bypass damper %, Kitchen EF status
EF	EF status, EF command
CHWP	Pump status, Pump command
VAV	Space temp, VAV DAT, VAV flow, Heat on/off

Additional Comments

- This 2-story building houses four dining rooms, a kitchen, and a bakery.
- Chilled water comes from central chilled water plant.
- Steam comes from heating plant.
- Interior lighting stated to be controlled by 10% occupancy sensors and 90% manual switches.

Halenbeck Hall North State ID# E26073S1665					
Area (sqft)	132,274	Year Built	1965	Occupancy (hrs/yr)	5,000

HVAC Equipment

Description	Type	Size	Notes
AHU 12, AHU 13, AHU 14, AHU 15, AHU 16, AHU 17, AHU 18, AHU 19, AHU 20, AHU 21	Constant volume	1.5 HP each	HW, no cooling, only run 2 AHUs at a time, serve the Main Gym
Dance Studio AHU, Handball Courts AHU, Men's Locker Rm AHU, Women's Locker Rm AHU, Office AHU, Perim. Office AHU, Sports Info Office AHU, Weight Rm AHU	Constant Volume	3 HP or less each	HW, no cooling
1 Steam to Hot Water HX			Provides hot water to North and South Halenbeck
2 HWPs	Constant Volume	(1) 7.5 HP, (1) 5 HP	
4 EFs	Constant Volume	2 HP each	Serve the Main Gym, staged based on space temp

Points on BAS

Description	Points
AHUs 12 through 21	SF status, Space temp, DAT, HW valve, MAT, Damper position
Dance Studio through Weight Rm AHUs	SF status, Space temp, Space setpoint
Heating System	Steam valve, HWST, Radiation pump status
EF	EF status, Space setpoint

Additional Comments

- Along with Halenbeck Hall South, these buildings house a main gym, a swimming pool, diving pool, two small gyms, a track, racquetball courts, wrestling room, weight room, and dance studio.
- This building is not cooled.
- Steam comes from central plant.
- The Main Gym gets overheated during the summer because there is no cooling.
- There are a lot of weekend events in this building.
- Interior lighting stated to be controlled by 60% occupancy sensors, 10% schedule, and 30% manual switches.

Halenbeck Hall South State ID# E26073S1660					
Area (sqft)	100,000	Year Built	1980	Occupancy (hrs/yr)	5,000

HVAC Equipment

Description	**Type**	**Size**	**Notes**
SF1, SF2, SF3, SF4, SF5, SF6, SF7, SF8, SF9	Constant Volume AHUs	10 HP each	Steam, no cooling
SF10	Constant Volume AHU	7.5 HP	Steam, no cooling
Pool AHU	Constant Volume	13,800 cfm, 15 HP	HW, DX cooling

Points on BAS

Description	**Points**
SF1-SF6, SF8	Fan status
SF7,SF9-10	Fan status, MAT, Damper position, Hot Deck Temp, Valve Position
Pool AHU	RAT, RARH, SF status, DX on/off, HW valve
Pool Controls	DX heat reclaim on/off, Pump status, Pool temp, Steam valve

Additional Comments

- See Halenbeck Hall North for the space uses in this building.
- This building is not cooled, except for the pool area, which has DX cooling.
- Steam comes from central plant.
- Hot water comes from Halenbeck Hall North.
- Interior lighting stated to be controlled by 20% occupancy sensors and 80% manual switches.

Heating and Maintenance I
State ID# E26073S1050

Area (sqft)	18,892	Year Built	1950	Occupancy (hrs/yr)	2,470

HVAC Equipment

Description	Type	Size	Notes
3 Boilers	Steam	(2) 70,000 kBtu/hr, (1) 40,000 kBtu/hr	The steam pressure is kept at 115 psi year-round. Boilers can use natural gas, fuel oil #2, or fuel oil #6.
MAU	Constant Volume	Unknown	Direct gas-fired, not steam.

Points on BAS

Description	Points
Boiler 1	*No points available*
Boiler 2	*No points available*
Boiler 3	Firing rate, Oxygen, Flue temp, O2 trim, Drum level, Steam flow, Air flow trim, Feedwater valve, Feedwater valve setpoint, Boiler output temp/press, Combustion, Oil flow, Gas flow, Atomizing pressure

Additional Comments

- This is the central heating plant that distributes steam to the entire campus.
- This building is not cooled.
- There are few points on the BAS for the entire heating system. There are only the points available (listed above) for Boiler 3 and no points for Boilers 1 and 2.

James W. Miller Learning Resources Center (LRC) State ID# E26073S9600					
Area (sqft)	235,000	Year Built	2000	Occupancy (hrs/yr)	5,000
HVAC Equipment					

Description	Type	Size	Notes
AHU-1	VAV unit with SF and RF with VFDs	60 HP SF, 20 HP RF	Serves 35 VAV boxes
AHU-2	VAV unit with SF and RF with VFDs	40 HP SF, 20 HP RF	Serves 46 VAV boxes
AHU-3	VAV unit with SF and RF with VFDs	30 HP SF, 7.5 HP RF	Serves 47 VAV boxes
AHU-4	VAV unit with SF and RF with VFDs	15 HP SF, 10 HP RF	Serves 22 VAV boxes
AHU-5	VAV unit with SF and RF with VFDs	5 HP SF, 4 HP RF	Serves 36 VAV boxes
AHU-6	VAV unit with SF and RF with VFDs	5 HP SF, 3 HP RF	SF VFD controlled of zone temperature requirements
AHU-7, AHU-8	Liebert Units	Unknown	These are Computer Room Air Conditioning (CRAC) units that serve the computer room and archives area
AHU-9	VAV unit with SF and EF with VFDs	7.5 HP SF, 3 HP EF	100% OA unit utilizes an energy recovery wheel to preheat outside air. There is a glycol heat exchanger and the heating coil in this unit has glycol since this is a 100% OA unit. Contains 10 VAV boxes with hot water reheat.
196 VAV boxes			HW reheat coils
1 Steam to Hot Water HX			
2 HWPs	Variable Volume with VFDs	5 HP each	
2 CHWPs	Variable Volume with VFDs	7.5 HP each	
13 EFs	Constant Volume	All less than 1 HP each	
HW FTR			

Points on BAS- James W. Miller LRC

Description	Points
AHU-1 through AHU-6	RA dew point, RAT, RF status, RF speed, RA/OA/EA damper position, MAT, SF status, SF speed, Supply duct static, Supply duct static setpoint, Steam valve %, CHW valve %, DARH, DAT, DAT setpoint, RF offset, Humidifier valve %
AHU-7	DAT, Fan status, Supply glycol temp, Return glycol temp
AHU-8	Intake temp, Intake dew point, Fan status
AHU-9	RAT, EF speed, EF VFD status, EAT, OA damper position, Preheat temp, Preheat valve %, SF status, SF speed, HW valve%, CHW valve %, DAT, Supply duct static, Supply duct static setpoint, Energy wheel status, Energy wheel speed, Exchanger supply temp, Exchanger return temp, Exchanger valve
VAV	Space temp, VAV DAT, VAV flow, Heat on/off
Heating System	HWDP, HW pump speed, HW pump status, Converter status, HWST, HWRT, Converter valve, Steam system pressure
Chilled Water	CHWST, CHWRT, CHW pump speed, CHW pump status, CHW flow, CHW differential pressure
EF	EF status
FTR	Space temp

Additional Comments

- This 2-story building houses library space, computer rooms, auditorium, classrooms, study rooms, and a coffee shop.
- Chilled water comes from central plant.
- Steam comes from central plant.
- This building has HW fin tube radiation that is controlled to thermostats.
- Stated 98% of interior lighting is controlled by occupancy sensors.
- Building was built in 2000 and not known to be commissioned.

Mitchell Hall
State ID# E26073S5258

Area (sqft)	109,784	Year Built	1958	Occupancy (hrs/yr)	8,760

HVAC Equipment

Name	Type	Size	Notes
AHU-1	Constant volume with SF and RF	0.75 HP SF Unknown RF HP	HW and 2-stage DX, serves corridors, computer room, and activity room main lobby.
2 EFs		Less than 1 HP each	
1 DX Unit		20 Tons	Serves AHU-1
2 Radiation HW Pumps	Constant volume	5 HP each	HW pumps for radiation in dorm rooms.

Points on BAS

Name	Points
AHU-1	Roof isolation damper, Econ/return damper, Relief damper, Minimum relief damper setpoint, MAT, MAT setpoint, SF status, SF command, Heat valve, Cooling stage 1, Cooling stage 2, DAT, DAT setpoint, RAT, Heating space temperature setpoint, Cooling space temperature setpoint, 3rd floor lounge temperature, 2nd floor lounge temperature, Average space temperature, RAT, RF status, RF command, OAT
Heating System	HWST, HWST setpoint, Pump status, Pump command
EF	EF status, EF command

Additional Comments

- This is a 4-story dormitory that houses 418 women.
- AHU-1 utilizes a 20 ton condensing unit for cooling.
- Steam comes from central plant.
- Interior lighting stated to be controlled by manual switches.

National Hockey Center State ID# E26073S2889					
Area (sqft)	152,055	Year Built	1989	Occupancy (hrs/yr)	Varies

HVAC Equipment

Name	Type	Size	Notes
Main Rink Desiccant Unit	Constant Volume	40 HP SF, 10 HP RF	
Practice Rink Desiccant Unit	Constant Volume	20 HP SF, 5 HP RF	
AHU-1	Constant Volume	2.5 HP SF	
AHU-2	Constant Volume	2.5 HP SF	
AHU-6	Constant Volume	3 HP SF	
AHU-7	Constant Volume	3 HP SF	
SE RTU	Constant Volume	40 HP SF, 15 HP RF	
SW RTU	Constant Volume	40 HP SF, 15 HP RF	
NW RTU	Constant Volume	40 HP SF, 15 HP RF	
10 Exhaust Fans		All less than 1 HP	
Boiler		900 kBtu/hr	HW boiler for perimeter radiation

Points on BAS

Name	Points
Desiccant Units	SF status, DAT, DA humidity, RTU status, Space humidity, Space temperature
AHUs	Control point (on/off), Status
RTUs	Fan command, DAT, Damper position, Space static pressure, Space static pressure setpoint
Exhaust Fans	EF command, EF status
Reheats	Fan status, Room stat, Space temperature, Space temperature setpoint, Reheat valve

Additional Comments

- This 3-story building houses two Olympic size hockey rinks, locker rooms, offices, weight rooms, and a pro shop.
- Interior lighting stated to be controlled by 30% occupancy sensors and 70% manual switches.
- This building has HW fin tube radiation.
- The lighting is currently being looked at for updating options.
- Both hockey rinks operate year-round and the ice is off each rink for a few weeks per year.
- A large addition will be added in 2012, but there will not be any new ice sheets added.

Recreational Facility State ID# E26073S10104					
Area (sqft)	40,000	Year Built	2005	Occupancy (hrs/yr)	5,000

HVAC Equipment

Name	Type	Size	Notes
AHU-1	VAV unit with SF and 2 RFs with VFDs	40,000 cfm, 75 HP SF, (2) 30 HP RFs	HW and CHW, serves 36 VAV boxes in Recreational Facility and Stadium
AHU-2	VAV unit with SF and RF with VFDs	10,000 cfm, 9.5 HP SF, 7.5 HP RF	100% OA, glycol heating coil and CHW, Heat recovery wheel between EA and OA, serves 18 VAV boxes in Stadium locker rooms.
54 VAV boxes			All of the VAV boxes have HW reheat, except a few have electric resistance.
13 Unit Heaters			Steam heat
1 Steam to HW HX			
1 HW to Glycol HX			AHU-2 is 100% OA, so the heating coil is glycol to prevent freezing of coil.
2 HW Pumps	Variable Volume with VFDs	15 HP each	
2 Glycol Pumps	Constant Volume	1.7 HP each	
2 CHW Pumps	1 Constant Volume, 1 Variable Volume with VFD	20 HP each	

Points on BAS

Name	Points
AHU-1	RAT, RARH, RA DSP, RF status, RF speed, OA/RA/EA damper position, MAT, SF status, SF speed, HW Valve, CHW valve, DAT, DA DSP, Space static pressure
AHU-2	RAT, RARH, Heat wheel status, Heat wheel speed, EAT, EARH, EA damper position, EF status, EF speed, Temp after heat wheel and before coils, Glycol heating valve, CHW valve, SF status, SF speed, DA DSP, DAT
VAV Boxes	Zone temp, VAV DAT, VAV flow, Heat on/off
Heating System	Steam valve, HWST, HW pump status, HWDP, HW pump speed, Glycol pump status, HW valve position, Glycol temp
Cooling System	CHWDP, CHW pump status, CHW pump speed, Secondary CHWST, Secondary CHWRT, Primary CHWRT, CHW return valve
Unit Heaters	Space temp, Unit status, Heat %

Additional Comments- Recreational Facility
• This building houses workout facilities for the students and a café. • Chilled water comes from central plant. • Steam comes from central plant. • Interior lighting stated to be controlled by 95% occupancy sensors and 5% manual switches. • The Stadium shares equipment with this building.

Stadium State ID# E26073S10204					
Area (sqft)	35,000	Year Built	2004	Occupancy (hrs/yr)	Variable
HVAC Equipment					
• NOTE: This building shares HVAC equipment with the Recreational Facility.					
Points on BAS					
• See the Recreational Facility.					
Additional Comments					
• This building houses locker rooms, restrooms, concessions, and indoor seating for sporting events. • There is a dome that covers the field during the winter. The dome shall NOT be included in the investigation of this building.					

Good Candidate Buildings

These buildings were determined to be good candidates for an energy investigation and likely will be included in future group(s) of buildings recommended to move forward to the investigation phase of PBEEEP.

51 Building
State ID# E26073S1868

Area (sqft)	52,085	Year Built	1968	Occupancy (hrs/yr)	3,500

HVAC Equipment

Name	Type	Size	Notes
AHU-1	VAV unit with SF and relief fan with VFDs	52,000 cfm, 60 HP SF, 20 HP RF	HW and CHW, serves VAV boxes
56 VAV boxes			All of the VAV boxes have HW reheat
3 Steam to HW HX			
3 HW Pumps	Constant Volume	(2) 3 HP each, (1) 2 HP	Pumps serve West Radiation, East Radiation, and Reheats
1 CHW Pump	Constant Volume	3 HP	
1 Exhaust Fan	Constant Volume	Less than 1 HP	

Points on BAS

Name	Points
AHU-1	Econ damper, Minimum econ damper setpoint, Relief damper, MAT, MAT setpoint, DAT, DAT setpoint, Duct static, Duct static setpoint, Space static, Space static setpoint, SF command, SF status, SF speed, Cool valve, Heat valve, RAT, RARH, RA CO2, Relief fan command, Relief fan status, Relief fan speed, OAT
VAV Boxes	Stat location, Space temperature, VAV DAT, Space temperature setpoint, CFM, Heat %
Heating System	HWST, HWST setpoint, Heat valve, Pump command, Pump status
CHW Pump	Pump command, Pump status
Exhaust Fan	EF Status

Additional Comments

- This 4-story building houses office space.
- Chilled water comes from central plant.
- Steam comes from central plant.
- This building has HW fin tube radiation.

51 Building Wing State ID# E26073S1868					
Area (sqft)	6,150	Year Built	1993	Occupancy (hrs/yr)	2,600

HVAC Equipment

Name	Type	Size	Notes
2 AHUs	Constant Volume	2 HP SF	Stand-alone AHUs that control to programmable thermostats. No points on the BAS.

Points on BAS

None

Additional Comments

- This 2-story building houses office space.
- Interior lighting stated to be controlled by 90% occupancy sensors and 10% manual switches.
- This building is included in this list because it is attached to the 51 Building.

Education Building State ID# E26073S1971					
Area (sqft)	101,006	Year Built	1971	Occupancy (hrs/yr)	3,510

HVAC Equipment

Name	Type	Size	Notes
S1	Constant Volume SF	40,000 cfm, 20 HP	HW and CHW, with HW terminal reheats
S2	Constant Volume SF	40,000 cfm, 20 HP	HW and CHW, with HW terminal reheats
S3	Constant Volume SF	30,000 cfm, 20 HP	HW and CHW, with HW terminal reheats
RF1	Constant Volume RF	55,000 cfm, 10 HP	
RF2	Constant Volume RF	55,000 cfm, 10 HP	
High to Low Pressure Steam HX			
2 Steam to HW HX			
2 HW Pumps	Constant Volume	0.5 HP and 3 HP	Serve radiation and reheats.

Points on BAS- Education Building

Name	Points
S1 S2 S3	MAT, Space temp, SF status, OA damper position, RF status
Heating System	HW pump status, HWST, HW valve
Cooling System	CHWST, CHWRT

Additional Comments

- This 2-story building houses classrooms.
- Chilled water comes from central plant.
- Steam comes from central plant.
- This building has HW fin tube radiation.
- Interior lighting stated to be controlled by 80% occupancy sensors and 20% manual switches.
- Over the years, large classrooms were divided up into smaller rooms and balancing air flows is an issue.
- Reheats run year-round to prevent over-cooling.
- The HVAC system is currently being redesigned and SCSU plans on bidding the work in 2012.

Engineering/Computing Center
State ID# E26073S1258

Area (sqft)	91,840	Year Built	1958	Occupancy (hrs/yr)	4,640

HVAC Equipment

Name	Type	Size	Notes
AHU 1	VAV unit with SF and RF with VFDs	15,000 cfm, 15 HP SF, 10 HP RF	CHW in AHU, HW terminal reheats
AHU 2	VAV unit with SF with VFDs	15,000 cfm, 15 HP SF	CHW in AHU, HW terminal reheats
AHU 3	VAV unit with SF and RF with VFDs	11,000 cfm, 10 HP SF, 15 HP RF	CHW, serves VAV boxes
AHU 4	VAV unit with SF and RF with VFDs	9,000 cfm, 7.5 HP SF, 10 HP RF	CHW in AHU, HW terminal reheats
AHU 5	VAV unit with SF and RF with VFDs	26,000 cfm, 15 HP SF, 10 HP RF	CHW in AHU, HW terminal reheats
AHU 6	VAV unit with SF and RF with VFDs	12,000 cfm, 7.5 HP SF, 3 HP RF	CHW in AHU, HW terminal reheats, serves the Child Care Center
4 VAV Boxes			All boxes have HW reheat
1 Steam to HW HX			
2 HWPs	Constant Volume	7.5 HP each	
1 CHWP	Constant Volume	10 HP	

Points on BAS- Engineering/Computing Center

Name	Points
AHU 1 AHU 3 AHU 4 AHU 5 AHU 6	RF status, RF speed, OA/RA/EA damper position, MAT, SF status, SF speed, DA DSP
AHU 2	OA/RA/EA damper position, MAT, SF status, SF speed, DA DSP
VAV boxes	Space temp, VAV flow, Heat on/off, Radiation on/off
Heating System	HW pump status, Radiation temp
Cooling System	CHW pump status

Additional Comments

- This 2-story building houses classrooms and laboratories, as well as the Child Care Center.
- Chilled water comes from central plant.
- Steam comes from central plant.
- This building has HW fin tube radiation.
- Interior lighting stated to be controlled by 80% occupancy sensors and 20% manual switches.
- According to the building staff, this building is difficult to control.

Kiehle Visual Arts Center
State ID# E26073S1152

Area (sqft)	59,984	Year Built	1952	Occupancy (hrs/yr)	2,000

HVAC Equipment

Name	Type	Size	Notes
AHU 1	VAV unit with SF and RF with VFDs	Unknown cfm, 20 HP SF, 7.5 HP RF	CHW and HW, serves 10 VAV boxes
AHU 2	VAV unit with SF with VFDs	Unknown cfm, 25 HP SF, 5 HP RF	CHW and HW, serves 15 VAV boxes
AHU 3	VAV unit with SF and RF with VFDs	Unknown cfm, 20 HP SF, 3 HP RF	CHW and HW, serves 15 VAV boxes
40 VAV Boxes			All boxes have HW reheat
1 Steam to HW HX			
1 HW Pump	Variable Volume with VFD	7.5 HP	
1 CHW Pump	Variable Volume with VFD	7.5 HP	
7 EFs	Exhaust Fans	Unknown	

Points on BAS- Kiehle Visual Arts Center

Name	Points
AHU 1 AHU 2 AHU 3	Econ damper, Minimum econ damper, MAT,MAT low limit, SF status, SF command SF speed, DAT, DAT setpoint, Duct static, Duct static setpoint, Space static, Space static setpoint, Heat valve, Cool valve, RAT, RAT setpoint, RF status, RF speed, RF command, OAT
VAV boxes	Stat location, Space temperature, Space temperature setpoint for heating and cooling, CFM, Heat command
Heating System	Pump status, Pump command, HWDP, HWDP setpoint, Pump speed, HWST, HWST setpoint, Reheat valve, OAT
Cooling System	CHWST, CHWRT, CHWRT setpoint, CHW differential pressure, CHW differential setpoint, CHW flow, Pump command, Pump status, Pump speed
Exhaust Fan	EF command

Additional Comments

- This 3-story building houses classrooms, studio space, and a public art gallery.
- Chilled water comes from central plant.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 80% occupancy sensors and 20% manual switches.

Parking Ramp
State ID# E26073S5709

Area (sqft)	158,798	Year Built	2008	Occupancy (hrs/yr)	N/A

HVAC Equipment

Name	Type	Size	Notes
Elevator AHU		2 HP SF	
Electric baseboard heat			
4 Unit Heaters			Electric
6 Cabinet Unit Heaters			

Points on BAS

Name	Points
Unit Heaters	Setpoint, Temp
Lighting	Status

Additional Comments

- This building is not cooled.
- This ramp has 150 watt pulse start metal halide fixtures. The lighting is controlled by the building automation system based on ambient light levels and time of day scheduling.

Performing Arts Center State ID# E26073S1768					
Area (sqft)	78,674	Year Built	1968	Occupancy (hrs/yr)	5,278
HVAC Equipment					

Name	Type	Size	Notes
F1	Constant Volume AHU with SF and RF	24,700 cfm, 20 HP SF, 5 HP RF	CHW, serves HW terminal reheats. This air handler is the main air handler for the building.
F3	Constant Volume AHU with SF and RF	3,275 cfm, 3 HP SF, 1 HP RF	CHW and HW
F5	Constant Volume AHU with SF and RF	3,675 cfm, 3 HP SF, 0.75 HP RF	CHW and HW
F7	VAV AHU with SF and RF with VFDs	5,460 cfm, 5 HP SF, 1 HP RF	CHW, serves VAV boxes and HW terminal reheats
F10	VAV AHU with SF and RF with VFDs	8,400 cfm, 7.5 HP SF, 1 HP RF	CHW and HW, serves VAV boxes
F12	Constant Volume AHU with SF	6,720 cfm, 5 HP SF	CHW and HW
F14	VAV AHU with SF with VFD	16,800 cfm, 15 HP SF	CHW and HW
F15	Constant Volume AHU with SF	10,000 cfm, 1 HP SF	CHW and HW
F16	Constant Volume AHU with SF	840 cfm, 1 HP SF	CHW and HW, Face/Bypass, 100% OA
F17	Constant Volume AHU with SF	5,040 cfm, 3 HP SF, 1/3 HP RF	CHW and HW
7 VAV boxes			HW reheat
Preheat System	Steam		Outside air is preheated and air is delivered to F1, F3, F5, F7, F12 and F15 (“East Preheat”) and to F14 (“West Preheat”). The temperature of the air is controlled by a steam valve and set to an OA preheat setpoint.
4 Steam to HW HXs			
4 HW Pumps	Constant Volume	(3) 5 HP each, (1) 1 HP	
1 CHW Pump	Constant Volume	Unknown	This pump is not in use.

Points on BAS- Performing Arts Center

Name	Points
F1	RARH, RF status, OA/RA/EA damper position, MAT, SF status, CHW valve, DAT, DARH
F3, F5	RAT, RF status, OA/RA damper position, MAT, SF status, HW valve, CHW valve, DAT
F7	RAT, RF status, RF speed, RA/EA/OA damper position, MAT, SF status, SF speed, CHW valve, DAT, Supply static pressure, Space temp, Space static pressure
F10	RAT, RARH, RF status, RF speed, OA/RA/EA damper position, MAT, SF status, SF speed, HW/CHW valve, Humidifier, DAT, Supply static pressure, DARH, Space temp, Space static pressure
F12, F15, F17	RAT, OA/RA damper position, MAT, SF status, HW valve, CHW valve, DAT, Space temp
F14	RAT, RA/OA/EA damper position, MAT, SF status, SF speed, HW/CHW valve, DAT
F16	Wing damper position, Steam valve, Face/Bypass damper position, CHW valve, SF status, Humidifier, DAT, DARH, Space RH
VAV boxes	Temperature, Setpoint, Flow, Heat (on/off)
Reheats	Setpoint, Space temp, DAT, Valve % open
Preheat	Preheat DAT, Preheat OA intake temp, Preheat steam valve, Preheat wing damper position
Cooling System	CHW pump status, CHWRT, CHW setpoint, Valve position
Heating System	HWP status, HWST, HW setpoint, Valve position

Additional Comments

- This 2-story building houses classrooms, offices, theaters, halls, and practice studios.
- Chilled water comes from central plant.
- Steam comes from central plant.
- This building has HW fin tube radiation.
- Interior lighting stated to be controlled by 40% occupancy sensors and 60% manual switches.

Stewart Hall State ID# E26073S0948					
Area (sqft)	177,951	Year Built	1948	Occupancy (hrs/yr)	Unknown
HVAC Equipment					

Name	Type	Size	Notes
SF1	VAV AHU with SF and RF with VFDs	18,000 cfm, 15 HP SF, 5 HP RF	CHW and HW, serve VAV boxes
SF2	VAV AHU with SF and RF with VFDs	25,000 cfm, 20 HP SF, 7.5 HP RF	CHW and HW, serve VAV boxes
SF3	VAV AHU with SF and RF with VFDs	40,000 cfm, 30 HP SF, 15 HP RF	CHW and HW, serve VAV boxes
SF4	VAV AHU with SF and RF with VFDs	45,000 cfm, 30 HP SF, 15 HP RF	CHW and HW, serve VAV boxes
SF5	VAV AHU with SF and RF with VFDs	20,000 cfm, 15 HP SF, 7.5 HP RF	CHW and HW, serve VAV boxes
SF6	Constant Volume with SF	1 HP SF	
SF7	Constant Volume with SF	1 HP SF	
SF8	VAV AHU with inlet guide vanes on SF	12,000 cfm, 7.5 HP SF	CHW and HW
242 VAV Boxes			No reheat
Chiller	Trane	100 Tons	2 compressors
1 Steam to HW HX			
2 HW Pumps	Constant Volume	5 HP each	
2 CHW Pumps	Constant Volume	15 HP each	

Points on BAS- Stewart Hall

Name	Points
SF1, SF2, SF3, SF4	RAT, RF status, RF speed, OA/RA/EA damper position, MAT, SF status, SF speed, HW/CHW valve, DAT, DA DSP, Space static pressure, Space temp
SF5	RAT, RF status, RF speed, OA/RA/EA damper position, MAT, SF status, SF speed, HW/CHW valve, DAT, Space static pressure, Space temp
SF6, SF7	SF status, Thermostat (on/off)
SF8	Status, DAT, MAT, RAT, DA DSP, OA/RA/EA damper position, HW/CHW valve
Heating System	HWST, HWRT, Converter status, HW pump status
Cooling System	CHWST, CHWRT, CHW pump status, Chiller status

Additional Comments

- This 3-story building houses classrooms, offices, media facilities, TV studio, radio station, and an auditorium.
- Steam comes from central plant.
- This building has HW fin tube radiation.
- Interior lighting stated to be controlled by 50% occupancy sensors and 50% manual switches.

Potential Candidate Buildings

These buildings were determined to be potentially good candidates for an energy investigation and may be included in future group(s) of buildings recommended to move forward to the investigation phase of PBEEEP. It has yet to be determined which of these buildings will or will not be recommended for investigation. That decision will be partly based on the results of the Phase 1 investigation and may require additional site visits to gather further information on the equipment in the buildings.

Administration Services Building
State ID# E26073S2475

Area (sqft)	59,545	Year Built	1975	Occupancy (hrs/yr)	2,600

HVAC Equipment

Name	Type	Size	Notes
SF-1	VAV AHU with SF with VFD	34,500 cfm, 40 HP SF	CHW, serves HW terminal reheats
SF-2	VAV AHU with SF with VFD	20,600 cfm, 20 HP SF	CHW, serves HW terminal reheats
58 Terminal Reheats			HW, also referred to as "Convector Zones"
4 Steam to HW HX			

Points on BAS

Name	Points
SF-1, SF-2	Econ damper, Minimum econ damper, MAT, MAT setpoint, DAT, DAT cooling setpoint, DAT high limit setpoint, DAT low limit setpoint, SF command, SF status, SF speed, Cool valve, Space temperature setpoint, Average floor space temperature, 2nd floor north space temperature, 2nd floor south space temperature
Terminal Reheats	Stat location, Space temperature, Space temperature setpoint, Heat valve
Cooling System	Cooling required, CHWST, CHWRT, CHWRT setpoint, Loop valve

Additional Comments

- This 2-story building houses office space.
- This building is currently undergoing renovations. VAV boxes with HW reheat are being added and new heating and cooling coils are being added to the AHUs. The second floor is complete and the first floor will be done soon. Pumps and steam to HW converters are to be installed as well. This work is not being commissioned.
- Chilled water comes from central plant.
- Steam comes from central plant.

Atwood Memorial Center State ID# E26073S8066					
Area (sqft)	181,465	Year Built	1966	Occupancy (hrs/yr)	5,000
HVAC Equipment					

Name	Type	Size	Notes
AHU-3	VAV unit with SF and RF with VFDs	Unknown cfm, 10 HP SF, 5 HP RF	CHW and steam, serves VAV boxes
AHU-4	VAV unit with SF and RF with VFDs	Unknown cfm, 30 HP SF, 15 HP RF	CHW and HW/Glycol, serves VAV boxes
AHU-5	VAV unit with SF with VFD	Unknown cfm, 7.5 HP SF	CHW and steam, serves VAV boxes
AHU-11	VAV unit with SF with VFD	Unknown cfm, 7.5 HP SF	CHW and steam, serves VAV boxes
AHU-12	VAV unit with SF with VFD	Unknown cfm, 10 HP SF	CHW and steam, serves VAV boxes
AHU-13	VAV unit with SF with VFD	Unknown cfm, 10 HP SF	CHW and steam, serves VAV boxes
AHU-21	VAV unit with SF and RF with VFDs	Unknown cfm, 7.5 HP SF, 5 HP RF	CHW and steam, serves VAV boxes
AHU-22	VAV unit with SF with VFD	Unknown cfm, 15 HP SF	CHW and steam, serves VAV boxes
AHU-23	VAV unit with SF with VFD	Unknown cfm, 15 HP SF	CHW and steam
AHU-24	VAV unit with SF with VFD	Unknown cfm, 15 HP SF	CHW and steam, serves HW reheats
AHU-31/ AHU-1	VAV unit with SF and RF with VFDs	Unknown cfm, 15 HP SF, 5 HP RF	CHW and steam, serves VAV boxes
AHU-32/ AHU-2	VAV unit with SF and RF with VFDs	Unknown cfm, 15 HP SF, Unknown RF HP	CHW and steam, serves VAV boxes
92 VAV Boxes			HW reheat
MAU-1	Constant Volume	5 HP SF, 3 HP RF	
HWP 1, HWP 2	Constant Volume	126 gpm, 1.5 HP each	
HWP 3, HWP 4	Constant Volume	5 HP each	
HWP 5, HWP 6	Constant Volume	250 gpm, 10 HP each	
2 CHW Pumps	Constant Volume	20 HP each	

Points on BAS- Atwood Memorial Center

Name	Points
AHU-3, AHU-4, AHU-21, AHU-31/ AHU-1, AHU-32/ AHU-2	Econ damper, RA damper, Relief damper, MAT, MAT low limit, DAT, DAT setpoint, SF command, SF status, SF speed, Duct static pressure, Duct static pressure setpoint, Space static pressure, Space static pressure setpoint, Heat valve, Cool valve, RAT, RARH, RF command, RF status, RF speed
AHU-5, AHU-11, AHU-12, AHU-13, AHU-22, AHU-23, AHU-24	Econ damper, RA damper, Relief damper, MAT, MAT low limit, DAT, DAT setpoint, SF command, SF status, SF speed, Duct static pressure, Duct static pressure setpoint, Space static pressure, Space static pressure setpoint, Heat valve, Cool valve, RAT, RARH
VAV Boxes	Stat location, Space temperature, VAV DAT, Space temperature setpoint, CFM, Heat valve
Reheat Valves	Space temperature, Space temperature setpoint, Reheat valve
Heating System	Pump command, Pump status, HWST, HWST setpoint, HWRT, Converter valve
Cooling System	CHWST, CHWRT, CHWRT setpoint, Loop valve, Pump command, Pump status, CHW differential pressure, CHW differential pressure setpoint, Pump speed

Additional Comments

- This 3-story building houses dining and recreational facilities, an art gallery, theater, office space, computer labs, retail space, and meeting rooms.
- Chilled water comes from central plant.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 95% occupancy sensors and 5% manual switches.

Benton Hall North State ID# Unknown					
Area (sqft)	25,617	Year Built	1968	Occupancy (hrs/yr)	6,570

HVAC Equipment

Name	Type	Size	Notes
Radiation Pump 1	Constant Volume HWP	1.5 HP	
Radiation Pump 2	Constant Volume HWP	1.5 HP	
1 Steam to HW HX			Shared with Benton Hall South

Points on BAS

Name	Points
HWPs	Pump status, Pump command
Heating System	Converter temp, Converter setpoint

Additional Comments

- This 3-story building is a dormitory that houses 288 men and women along with Benton Hall South.
- This building is not cooled.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 100% manual switches.

Benton Hall South State ID# E26073S6067					
Area (sqft)	35,375	Year Built	1967	Occupancy (hrs/yr)	6,570

HVAC Equipment

Name	Type	Size	Notes
Hallway MAU		5 HP	This is not on the automation system.
Radiation Pump 3	Constant Volume HWP	2 HP	
Radiation Pump 4	Constant Volume HWP	2 HP	
1 Steam to HW HX			Shared with Benton Hall North

Points on BAS

Name	Points
HWPs	Pump status, Pump command
Heating System	Converter temp, Converter setpoint

Additional Comments

- This 3-story building is a dormitory that houses 288 men and women along with Benton Hall North.
- This building is not cooled.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 100% manual switches.

Brown Hall State ID# E26073S1358					
Area (sqft)	78,821	Year Built	1958	Occupancy (hrs/yr)	3,000

HVAC Equipment

Name	**Type**	**Size**	**Notes**
AHU-1	Constant Volume with SF and RF	56,200 cfm, 60 HP SF, 40 HP RF	CHW and steam, serves 87 HW terminal reheats
AHU-2	Constant Volume with SF and RF	3 HP SF, 2 HP RF	CHW and steam
AHU-3	Constant Volume with SF	Unknown	HW only, 100% return air
AHU-4	Constant Volume with SF	20 HP SF	HW, 2-stage DX cooling, Humidifier valve, Preheat HW coil
3 Unit Heaters			
6 EFs		All less than 1 HP	
2 HWPs	Variable Volume with VFDs	7.5 HP each	
1 Steam to HW HX			

Points on BAS

Name	**Points**
AHU-1, AHU-2	Econ damper, RA dampers, Relief dampers, MAT, SF command, SF status, SF speed, 1/3 heat valve, 2/3 heat valve, Cool valve, DAT, DAT setpoint, DAT high limit setpoint, DAT low limit setpoint, RAT, RA CO2, RF command, RF status
AHU-3	RAT, SF status, SF control, Heat valve, DAT, DAT setpoint, Space temp, Space temp setpoint
AHU-4	Econ damper, Pre-heat valve, Face bypass damper%, Pre heat air temperature, Pre heat temperature setpoint, MAT, MAT setpoint, DX stage 1, DX stage 2, SF command, SF status, Humidifier valve, Heat valve, DAT, DAT setpoint, DAT high limit setpoint, DAT low limit setpoint, OAT, RAT, RARH, RARH setpoint
Reheats	Stat location, Space temperature, Reheat DAT, Space temperature setpoint, Heat valve
Exhaust Fans	EF command, EF status
Unit Heaters	Space temperature setpoint, Space temperature
Heating System	Hot water system enable, HW pump 1 command, HW pump 1 status, HW pump 1 speed, HW pump 2 command, HW pump 2 status, HW pump 2 speed, HWDP, HWDP setpoint, HWST high limit setpoint, HWST low limit setpoint, Calculated HWST, HWST, HWRT, HW 1/3 converter valve, 2/3 converter valve

Additional Comments- Brown Hall

- This 3-story building houses classrooms and office space.
- Most of the equipment in this building was renovated. Only AHU-4 is still original. That work was completed in Spring 2010 and was commissioned.
- Chilled water comes from central plant.
- Steam comes from central plant.
- This building was remodeled in 2010. That work was commissioned.

Case Hall
State ID# E26073S5663

Area (sqft)	40,492	Year Built	1964	Occupancy (hrs/yr)	6,570

HVAC Equipment

Name	Type	Size	Notes
North Radiation Pump	Constant Volume	5 HP	Pumps HW to Case and Hill Halls as well as attached lounge
South Radiation Pump	Constant Volume	3 HP	Pumps HW to Case and Hill Halls as well as attached lounge
1 Steam to HW HX			HW is sent to Case and Hill Halls and attached lounge.

Points on BAS

Name	Points
HW Pumps	Pump status, Pump command
Heating System	Converter temp. (HWST), Converter setpoint (HWST Setpoint), OAT

Additional Comments

- This 3-story building is a dormitory that houses 190 men.
- This building is not cooled.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 20% occupancy sensors and 80% manual switches.
- This building should be investigated in conjunction with the attached Lounge and Hill Hall.
- The HVAC systems in Case Hall, the attached Lounge, and Hill Hall are currently being redesigned. Bids for that work will go out in summer 2011.

Hill Hall
State ID# E26073S5461

Area (sqft)	42,342	Year Built	1962	Occupancy (hrs/yr)	8,760

HVAC Equipment

Name	Type	Size	Notes
AHU-1	VAV unit with SF with VFD	2 HP SF	2-stage DX cooling, no heat, serves VAV boxes
1 DX Unit		Unknown	
5 VAV boxes			HW reheat
HW FTR			

Points on BAS

Name	Points
AHU-1	Econ damper, RA damper, MAT, MAT low limit, SF command, SF status, SF speed, DAT, DAT cooling setpoint, Duct static pressure, Duct static pressure setpoint, Space static pressure, Space static pressure setpoint, RAT. DX stage 1, DX stage 2
VAV boxes	Stat location, Space temperature, Space temperature setpoint, CFM, Heat valve, VAV DAT

Additional Comments

- This 4-story building houses 150 women's dorm rooms and the St. Cloud State University Health Services facility.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 20% occupancy sensors and 80% manual switches.
- This building should be investigated in conjunction with the attached Lounge and Case Hall.
- Shares HW pumps and steam to HW HX with Case Hall.

Centennial Hall State ID# E26073S2071					
Area (sqft)	165,758	Year Built	1971	Occupancy (hrs/yr)	3,500

HVAC Equipment

Name	Type	Size	Notes
AHU-1	VAV unit with SF and RF with VFDs	27,000 cfm, 40 HP SF, 15 HP RF	CHW and HW, serves VAV boxes
AHU-2	VAV unit with SF and RF with VFDs	27,000 cfm, 40 HP SF, 15 HP RF	CHW and HW, serves VAV boxes
AHU-3	VAV RTU with 2 SFs and 1 RF with VFDs	57,000 cfm, 50 HP each SF, 40 HP RF	CHW and HW, serves VAV boxes
AHU-4	VAV RTU with 2 SFs and 1 RF with VFDs	57,000 cfm, 50 HP each SF, 40 HP RF	CHW and HW, serves VAV boxes
235 VAV boxes			HW reheat, 120 served by AHUs 1-2, 550 served by AHUs 3-4
2 Reheat Pumps	Variable Volume with VFDs	15 HP each	One is for back-up
1 CHW Pump	Variable Volume with VFDs	2.5 HP	
2 Steam to HW HXs			
16 Exhaust Fans		All less than 1 HP	
16 UHs	Unit Heaters		10 are Cabinet Unit Heaters
FTR			

Points on BAS

Name	Points
AHU-1, AHU-2, AHU-3, AHU-4	Econ damper, Minimum econ damper position, RA damper, Relief damper, MAT, MAT setpoint, minimum OA CFM, minimum OA CFM setpoint, Heat valve, Cool valve, SF command, SF status, SF speed, DAT, DAT setpoint, Duct static, Duct static setpoint, Average space pressure, Floor space pressure, Space pressure setpoint, RAT, RF command, RF status, RF speed
VAV boxes	Stat location, Space temperature, VAV DAT, Space temperature setpoint, CFM, Heat valve
Heating System	Pump command, Pump status, HWDP, HWDP setpoint, Pump speed, Calculated HWST, HWST, Converter 1 valve, Converter 2 valve, HWST high limit setpoint, HWST low limit setpoint, Domestic hot water setpoint, Domestic HWST, Domestic HW valve %
Cooling System	Pump command, Pump status, CHW pump differential pressure setpoint, CHW pump differential pressure, Pump speed, CHWST, CHWRT, CHWRT setpoint, 1/3 valve min% setpoint, 2/3 valve position
Exhaust Fans	EF command, EF status
UHs	Stat location, Space temperature, Space temperature setpoint, Heat valve

Additional Comments- Centennial Hall
• This 5-story building houses classrooms, offices, and three server rooms. • Chilled water comes from central plant. • Steam comes from central plant. • This building reopened in 2006 after being completely renovated. All new fans and reheat system were installed. This project was not commissioned.

Headley Hall
State ID# E26073S1462

Area (sqft)	52,898	Year Built	1962	Occupancy (hrs/yr)	Unknown

HVAC Equipment

Name	Type	Size	Notes
S-1	Constant Volume AHU with SF	Unknown	DX cooling, electric resistance heat, serves room 113A Scope Lab
1 DX Unit		Unknown	
3 Misc Fans	Two Univent Fans and one Exhaust Fan	Unknown	
FTR???			

Points on BAS

Name	Points
S-1	Econ damper, DX cooling on/off, SF status, Electric heat on/off, Humidifier % open, Damper minimum setpoint, OAT DX enable, Space temp, Space temp setpoint, Space RH, Space RH setpoint, DARH, DARH limit, OAT
Misc Fans	Fan status

Additional Comments

- This 2-story building houses shops, laboratories, classrooms, offices, and an auditorium.

Holes Hall State ID# E26073S5764					
Area (sqft)	80,213	Year Built	1965	Occupancy (hrs/yr)	8,760

HVAC Equipment

Name	Type	Size	Notes
Basement MAU	Constant Volume SF	5 HP SF	Glycol preheat and heat, no cooling
Penthouse MAU	Constant Volume SF	5 HP SF	Glycol heat and humidity valve, no cooling
5 EFs		Less than 1 HP each	
2 HW Radiation Pumps	Constant Volume	3 HP each	
Glycol Pump	Constant Volume	3 HP	
1 Steam to HW HX			
FTR			HW

Points on BAS

Name	Points
MAUs	SF status, DAT, calculated DAT, Heat valve, Space temperature setpoint, Space temperature, Space humidity setpoint, Space humidity, DA humidity, Supply humidity high limit, Humidity valve position, Preheat face bypass damper, Preheat DAT, Preheat DAT setpoint, Preheat valve position, Preheat OAT setpoint
Glycol System	Pump status, Glycol heat exchanger supply temperature, Glycol heat exchanger valve
Heating System	HWST, HWST setpoint, Pump status, Pump command, Domestic water HWST, Domestic water HWST setpoint, Domestic water valve %, OAT
Exhaust Fan	EF status, EF command

Additional Comments

- This 10-story building is a dormitory that houses 399 men and women.
- This building is not cooled.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 10% occupancy sensors and 90% manual switches.

Lawrence Hall (Original and Addition)
State ID# E26073S10303

Area (sqft)	42,725	Year Built	1905/2003	Occupancy (hrs/yr)	8,760

HVAC Equipment

Name	Type	Size	Notes
AHU 1	VAV unit with SF with VFD	3,000 cfm, 7.5 HP SF	HW and CHW, serves VAV boxes
AHU 2	Constant Volume with SF and EF	3,000 cfm, 7.5 HP SF, 5 HP RF	HW and CHW, heat recovery wheel, supplies ventilation air to corridors, the FCUs serve each room
8 VAV boxes			HW reheat
90 FCUs			CHW and HW
2 Unit Heaters			HW
1 Steam to HW HX			
2 HWPs	Variable Volume with VFD	5 HP each	
2 CHWPs	Variable Volume with VFD	10 HP each	
FTR			HW, controlled to t'stats

Points on BAS

Name	Points
AHU 1	RAT, RARH, OA/RA/EA damper position, SF status, SF speed, HW valve, CHW valve, Supply duct static pressure, Space CO2, CO2 setpoint
AHU 2	RAT, RF status, EARH (after heat wheel), EAT (after heat wheel), EA/OA damper position, OA (after heat wheel), Heat wheel status, Heat wheel speed, SF status, HW valve, CHW valve, DAT
VAV boxes	Space temp, VAV flow, Heat on/off, DAT, Space CO2
FCUs	Space temp, Radiation valve, CHW valve, DAT, Heat/Cool switch
Heating System	HWST, HWRT, Steam valve, Steam inlet pressure, Steam outlet pressure, HW pump status, HW pump speed
Cooling System	Primary CHWST, Primary CHWRT, Secondary CHWST, Secondary CHWRT, CHW control valve, CHW flow, CHW pump status, CHW pump speed, CHW differential pressure

Additional Comments

- This 4-story building houses 100 international students and office space.
- Chilled water comes from central plant.
- Steam comes from central plant.
- This building was recently renovated.

Public Safety Center State ID# E26073S5709					
Area (sqft)	4,879	Year Built	2008	Occupancy (hrs/yr)	8,760

HVAC Equipment

Name	Type	Size	Notes
AHU-1	VAV unit with SF and RF with VFDs	5,000 cfm, 7.5 HP SF, 2.5 HP RF	HW and 2-stage DX cooling, serves VAV boxes
11 VAV boxes			HW reheat
7 PRVs		Unknown	
1 EF		Less than 1 HP	
2 Boilers	HW	Unknown	Natural gas
2 HWPs	Variable Volume	1.5 HP each	

Points on BAS

Name	Points
AHU-1	Econ damper, OA CFM, OA CFM setpoint, Relief damper, MAT, MAT setpoint, DAT, DAT setpoint, SF status, SF command, SF speed, Duct static, Duct static setpoint, Space static, Space static setpoint, Heat valve, DX Stage 1, RF status, RF command, OAT
VAV boxes	Stat location, Space temperature, VAV DAT, Space temperature setpoint, CFM, Reheat command
PRVs	PRV command, PRV status
EF	EF command, EF status
Heating System	Mechanical room space temperature, Boiler 1 command, Boiler 1 status, Boiler 2 command, Boiler 2 status, HW pump 1A command, HW pump 1A status, HW 1A pump speed, HW pump 1B command, HW 1B pump status, HW 1B pump speed, HWDP, HWDP setpoint, HWST, HWST setpoint, HWRT, HW system OA temperature enable setpoint, Domestic HW pump command, Domestic HW pump status, Perimeter radiation (VAV-2,3,5) command, Perimeter radiation (VAV-4,9,11) command

Additional Comments

- This 3-story building houses office space.
- Interior lighting stated to be controlled by 100% occupancy sensors.
- Shares a natural gas and electric meter with the Parking Ramp.
- This building is not connected to the Central Chilled Water Plant or the Heating Plant.

Riverview Hall
State ID# E26073S0211

Area (sqft)	28,128	Year Built	1911	Occupancy (hrs/yr)	2,730

HVAC Equipment

Name	Type	Size	Notes
AHU 1	VAV unit with SF and RF with VFDs	Unknown cfm, 20 HP SF, 7.5 HP RF	HW and CHW, serves VAV boxes
AHU 2	VAV unit with SF and RF with VFDs	Unknown cfm, 20 HP SF, 7.5 HP RF	HW and CHW, serves VAV boxes
38 VAV boxes			HW reheat
7 Unit Heaters			HW
3 EFs		All less than 1 HP	
2 Steam to HW HXs			
2 HWPs	Variable Volume with VFDs	7.5 HP each	
1 CHWP	Variable Volume with VFD	5 HP	
FTR			HW

Points on BAS

Name	Points
AHU 1, AHU 2	RAT, RA CO2, RARH, RF status, RF speed, OA/EA/RA damper position, MAT, SF status, SF speed, HW valve, CHW valve, DAT, DA DSP, Space static pressure
VAV boxes	AHU, Stat location, Space temp, DAT, Space temp setpoint, Air flow, Heat
EFs	Enable setpoint temp, Status, Temp
Unit Heaters/ FTR	Setpoint, Temp
Heating System	HW pump status, HW pump speed, HWDP, HWST, HWRT, HW Converter valve, Steam pressure, Space temp (for unit heaters and radiation)
Cooling System	CHWP enable, Campus CHW supply pressure, Building CHW supply pressure, Building CHW return pressure, Building CHWST, Building CHWRT, CHWP 1 status, CHWP 1 speed, Building CHW DP, Building CHW DP setpoint

Additional Comments

- This 2-story building houses classrooms and office space.
- Chilled water comes from central plant.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 70% occupancy sensors and 30% low voltage control.
- This building was recently renovated. The work was completed in Spring 2010 and was commissioned.

Sherburne Hall
State ID# E26073S5967

Area (sqft)	107,428	Year Built	1969	Occupancy (hrs/yr)	8,760

HVAC Equipment

Name	Type	Size	Notes
S-1	Constant Volume	5 HP SF	HW preheat and heat
2 Steam to HW HXs			
2 HWPs	Constant Volume	5 HP each	Serve the north and south radiation

Points on BAS

Name	Points
S-1	SF command, SF status, DAT, DAT setpoint, Preheat temperature, Preheat temperature setpoint, Preheat valve, Heat valve, OAT
Heating System	HWST, HWST setpoint, Valve position, Pump command, Pump status, OAT

Additional Comments

- This 14-story building is a dormitory that houses 504 men and women.
- This building is not cooled.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 10% occupancy sensors and 90% manual switches.

Stearns Hall
State ID# E26073S5866

Area (sqft)	81,180	Year Built	1966	Occupancy (hrs/yr)	8,760

HVAC Equipment

Name	Type	Size	Notes
Basement MAU	Constant Volume SF	Unknown cfm, 5 HP SF	Glycol heat, no cooling
Penthouse MAU	Constant Volume SF	Unknown cfm, 5 HP SF	Glycol heat, no cooling
5 EFs		All less than 1 HP	
2 Steam to HW HXs			One is for the glycol system serving the MAUs and one is for HW FTR
2 HWPs	Constant Volume	3 HP each	Serve the north and south radiation
1 Glycol Pump	Constant Volume	3 HP	
FTR			HW

Points on BAS

Name	Points
MAU	SF status, DAT, Calculated DAT, Heat valve, Space temperature setpoint, Space temperature, Space humidity setpoint, Space humidity, DA humidity, Supply humidity high limit, Humidity valve position, Preheat face bypass damper, Preheat DAT, Preheat DAT setpoint, Preheat valve position, Preheat OAT setpoint
EFs	EF status, EF command
Heating System	HWST, HWST setpoint, Pump status, Pump command, Domestic water HWST, Domestic water HWST setpoint, Domestic water valve %, OAT
Glycol System	Pump status, Glycol heat exchanger supply temperature, Glycol heat exchanger valve

Additional Comments

- This 10-story building is a dormitory that houses 399 men and women.
- This building is not cooled.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 10% occupancy sensors and 90% manual switches.

Wick Science Building and Annex State ID# E26073S2172					
Area (sqft)	216,513	Year Built	1948/2008	Occupancy (hrs/yr)	8,760
HVAC Equipment					

Name	Type	Size	Notes
AHU-1	VAV unit with SF with VFDs	60,000 cfm, 50 HP	HW and CHW, serves VAV boxes in Annex, heat exchanger used to preheat OA with EA from EFs 1A, 2A, and 3A
SF-1	Constant Volume SF	14,000 cfm, 15 HP SF	HW and CHW
SF-2	Constant Volume SF	15,000 cfm, 15 HP SF	HW and CHW
SF-3	Constant Volume SF	16,000 cfm, 15 HP SF	HW and CHW
SF-4	Constant Volume SF	14,000 cfm, 15 HP SF	HW and CHW
SF-5	Constant Volume SF	16,000 cfm, 20 HP SF	HW and CHW
SF-6	Constant Volume SF	14,000 cfm, 15 HP SF	HW and CHW
SF-7	Constant Volume SF	17,000 cfm, 15 HP SF	HW and CHW
SF-8	Constant Volume SF	13,000 cfm, 15 HP SF	HW and CHW
23 VAV boxes			HW reheat, served by AHU-1 in the Annex
EF-1A, EF-2A, EF-3A	Constant Volume	30,000 cfm, 50 HP each	Exhaust air from the Annex, EA drawn through heat exchanger in AHU-1
35 EFs		400 – 4,839 cfm each	Serve the original building
4 Steam to HW HXs			One serves the Annex
1 Steam to Domestic HW HX			Serves the original building
5 HWPs	Variable Volume with VFDs	7.5-15 HP each	Two serve the Annex
3 CHWPs	Variable Volume with VFDs	(2) 40 HP, (1) 50 HP	The two 40 HP pumps serve the Annex
FTR			HW

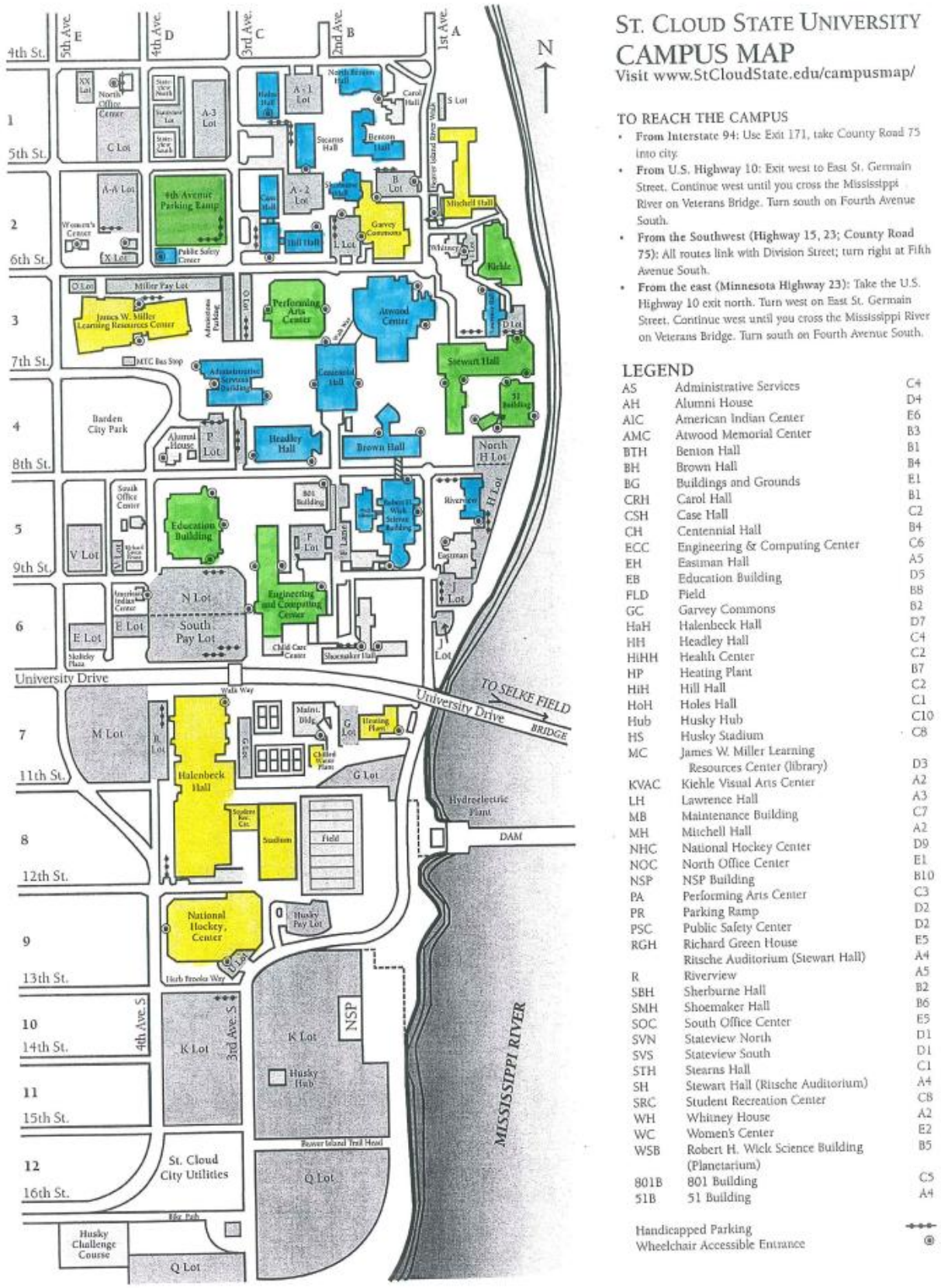
Points on BAS- Wick Science Building and Annex

Name	Points
AHU-1	OAT before heat exchanger, OAT(supply air to fan) after heat exchanger, Exhaust air before heat exchanger, Exhaust air after heat exchanger, SF command, SF status, SF speed, Cool valve, Heat valve, Humidifier valve, DAT, DAT setpoint, Duct static, Duct static setpoint, OAT, OA RH
SF-1 through SF-8	SF command, SF status, Damper setpoint, Damper %, DAT, DAT setpoint, Heat valve, Cool valve
VAV boxes	Stat location, Space temperature, VAV DAT, Space temperature setpoint, CFM, Reheat valve
EF-1A, EF-2A, EF-3A	Exhaust static, Exhaust static setpoint, EF 1A command, EF 1A status, EF 1B command, EF 1B status, EF 1C command, EF 1C status, Relief sash % open , Isolation damper
EFs	Group command
Heating System (Orig.)	System command, System status, HWST, HWST setpoint, Valve, OAT
Heating System (Annex)	HW pump status, HW pump command, HWDP, HWDP setpoint, HW pump speed, HW converter 1/3 valve, HW converter 2/3 valve, HWST high setpoint, HWST low setpoint, HWST setpoint, HWST, HWRT, OAT
Cooling System (Orig.)	CHWST, CHWRT
Cooling System (Annex)	CHW pump command, CHW pump status

Additional Comments

- This 5-story building houses classrooms, office space, laboratories, a planetarium, greenhouse, observatory, meteorology laboratory, and aquariums.
- Chilled water comes from central plant.
- Steam comes from central plant.
- Interior lighting stated to be controlled by 95% occupancy sensors and 5% manual switch.
- An energy study was recently completed on this building which included recommendations for adding energy saving measures; however the implementation has yet to start. If this project is implemented, the building will NOT be a candidate for further investigation.

Campus Map



NOTE: Yellow = Phase 1, Green = Good, Blue = Potential.

PBEEEP State Government

PBEEEP Abbreviation Descriptions			
AHU	Air Handling Unit	HP	Horsepower
BAS	Building Automation System	HRU	Heat Recovery Unit
CD	Cold Deck	HW	Hot Water
CDW	Condenser Water	HWDP	Hot Water Differential Pressure
CDWRT	Condenser Water Return Temperature	HWP	Hot Water Pump
CDWST	Condenser Water Supply Temperature	HWRT	Hot Water Return Temperature
CFM	Cubic Feet per Minute	HWST	Hot Water Supply Temperature
CHW	Chilled Water	HX	Heat Exchanger
CHWRT	Chilled Water Return Temperature	kW	Kilowatt
CHWDP	Chilled Water Differential Pressure	kWh	Kilowatt-hour
CHWP	Chilled Water Pump	MA	Mixed Air
CHWST	Chilled Water Supply Temperature	MA Enth	Mixed Air Enthalpy
CRAC	Computer Room Air Conditioner	MARH	Mixed Air Relative Humidity
CV	Constant Volume	MAT	Mixed Air Temperature
DA	Discharge Air	MAU	Make-up Air Unit
DA Enth	Discharge Air Enthalpy	OA	Outside Air
DARH	Discharge Air Relative Humidity	OA Enth	Outside Air Enthalpy
DAT	Discharge Air Temperature	OARH	Outside Air Relative Humidity
DDC	Direct Digital Control	OAT	Outside Air Temperature
DP	Differential Pressure	Occ	Occupied
DSP	Duct Static Pressure	PTAC	Packaged Terminal Air Conditioner
DX	Direct Expansion	RA	Return Air
EA	Exhaust Air	RA Enth	Return Air Enthalpy
EAT	Exhaust Air Temperature	RARH	Return Air Relative Humidity
Econ	Economizer	RAT	Return Air Temperature
EF	Exhaust Fan	RF	Return Fan
Enth	Enthalpy	RH	Relative Humidity
ERU	Energy Recovery Unit	RTU	Rooftop Unit
FCU	Fan Coil Unit	SF	Supply Fan
FPVAV	Fan Powered VAV	Unocc	Unoccupied
FTR	Fin Tube Radiation	VAV	Variable Air Volume
GPM	Gallons per Minute	VFD	Variable Frequency Drive
HD	Hot Deck	VIGV	Variable Inlet Guide Vanes

Conversions
1 kWh = 3.412 kBtu
1 Therm = 100 kBtu
1 kBtu/hr = 1 MBH